TEACHING SCHOOL ECONOMICS BY THE PERSONALIZED SYSTEM OF INSTRUCTION (PSI) : AN EXPERIMENTAL STUDY

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"Looked at as a business enterprise, the School and the College present a Woeboogone Spectacle. We find in education an antediluvian teachnology which would not survive for an instant in any other economic sector. The teaching methods and learning techniques ...... are rusty, cranky and antiquated."

— Malcolm Adiseshiah,
'Education and National Development'.
in Unesco chronicle, XIII, No.2
(Paris : Unesco, February, 1967).

CHAPTER ONE

INTRODUCTION

1.1 Teaching in School :

Teaching is giving instruction to pupils in a class room about something based on lesson plans.

Teaching clearly occurs when (1) the teacher plans in concrete a scheme of learning and progress including formative and summative evalution of the pupils (Bloom, 1971), when the teacher directs pupils to do certain things with the intention that pupil learn from those activities (Skinner, 1969) and when the teacher interacts directly with one or more pupils with the intention that the pupils learn from the encounter (Gage, 1963).

In classroom teaching, the teacher needs to develop the arts of narration, questioning and blackboard work as three important aids to success; but each of them is liable to its own weakness. Hence efforts were made to discover a more systematic method of teaching of universal application than the classroom teaching' e.g. the natural method of Comenius, the psychological synthesis of Pestalazzi, the intellectual analysis of Herbert, the autodidactic method of Montessori, the Project method of Kilpatrick and the Dalton plan of Helen Parkhurst. In their different ways they all emphasised the 'self activity' of the child and the necessity for basing education on the learner's experience. In this 'learning Society' of today, the chief purpose of the teacher is to make his pupils, in time, independent of his help (UNESCO, 1971).

1.2 Teaching of Economics in Secondary Schools :

Economics is a subject which was taught in Pre-independent India at the undergraduate level. The concept of teaching Economics at the School level came through the teaching of Civics since the implementation of Kothari Commission (1964-66) for general students of Secondary Schools. Economics as an elective subject was included in the humanities Stream in 1960's when higher Secondary stage began from Class IX. Now, Civics-Economics as a subject is taught as an optional subject in Class IX & X. The students are also examined in Madhyamik examination in West Bengal in the above-mentioned subject who opt Civics-Economics as an optional subject. the Syllabus of the Economics portion of that paper under West Bengal Board of Secondary Education is given below :

(a) Outline of Syllabus : Economics

Class IX :

1. The nature of economic activities.
2. Economic activity of the household consumption.
3. Production — the concept of the firm — classification of factors of production and their earnings.
4. Classification of firms : Single-ownership. Partnership, Joint-stock Companies.

   Co-operation — different types fo Co-operative societies. Small scale and large scale production.

Class X :

5. Market.

   Demand and Supply — Elastic and Inelastic demand — Elastic and Inelastic Supply — Price and output of the firm under perfect competition and under monopoly.
6. Money — functions of money — Description of the banking system (Commercial and Central banking).

(b) The subject Economics assumed different positions in School curriculum in different periods. When streaming (7 in number) was introduced in Schools on and from Class IX

- X (though Mudaliar Commission, 1952-53, recommended for IX-XII) Economics was included in the curriculum as one of the elective subjects in the Humanities group. But due to some reasons when we again came back, on and from 1974, to the Madhyamik Syllabus, having general education upto Class X, Economics got the position of an aditional subject. The Syllabus naturally was reduced a little bit, to cope with the academic time period and age group of the pupils. However some of the topics of economics were included in geography to be studied by all the pupils.

(c) Difficulties of teaching Economics in Schools by lecture method :

Curriculum and methods are intimately interlinked. If the curriculum is the totality of all experiences that the schools arrange for the learner then methods are the suitable ways of bringing the learner to realize these experiences. A method is a body of pedagogical principles and procedures.

In Secondary schools, teaching of Economics is based on the traditional conventional lesson plan method depending mainly on lecturing. Hence it faces the same problem inherent in this Traditional Conventional lesson plan method of teaching. Lesson Plan is constructed on Herbartian steps of clearness, association, system and method. Ziller and others divided these four steps into the following five steps, e.g.

(1) Preparation — i.e. asking of some questions on previous knowledge to come to day's lesson & announcement of day's lesson.

(2) Presentation — of the matter through questioning. (Preparation and Presentation both lead to clearness).

(3) Comparison and Concretisation (both lead to association) of the matter by correlated studies and with the help of teaching aid.

(4) Simplification (system) — With the help of teaching aids.

(5) Application (Method) — Assessment of acquired knowledge by questioning.

In this traditional Conventional Lesson Plan method of teaching, student participation is minimum and immediate feed back can not be given. The emphasis is on the teacher instructing the students rather than on the students learning from the teacher.

Considering the loopholes of the traditional lecture method, the researcher tried to make an humble effort to teach an important subject, Economics, by an experimental method, PSI, the Personalized System of Instruction, at the Secondary 'School level'.

1.3 Search for Alternative teaching methods :

In a country like India, the problem of educating teaming millions needs methods suited to large classes. Gradually by the impact of Educational Technology, more dynamic methods of teaching are evolving day by day. Our growing awareness of Group dynamics and Group behaviour are at the root of the incorporation of International approaches in the methods of teaching. All these considerations led to the development of many non-traditional approaches in teaching School subjects e.g. Economics. These are the followings :

1. Programmed learning.
2. Learning Package.
3. Instructional Radio.
4. Educational Television.

5. Personalized System of Instruction (PSI) or Keller Plan and other methods, based on Mastery Learning.

In India, Programmed Learning, Instructional Radio and Educational Television are now used selectively.

Programmed Approach vis-a-vis Traditional Approach to Teaching :

The Superiorityof Programmed approach over Traditional approach was thoroughly studied in India [Shah, 1964; Sharma R.A., 1966; Sharma, M.M., 1966; Desai, 1966; Shah, 1969; Pandya, 1974; and others] in different subjects. The findings of all these studies revealed that the group taught through the Programmed Learning material achieved higher on the post-test as compared to the group taught in the Tratidional way of lecture method. these findings were not limited to the urban area only. The studies by Sharma, R.A. (1966) and Sharma, M.M. (1966) included samples from rural areas also. The studies conducted by the State Institutes of Education (SIE 1970), confirmed the findings of the above researches.

The effectiveness of Programmed Learning approach was studied in terms of immediate scores on the post-test as well as its retention too. Sharma, M.M. 1966, Kulkarni, 1969 and the SIE, Gujarat (1970) found that the retention scores of the experimental group were better than those of the control group. Shah (1964) introduced another variation in her Study. She had three treatment groups in her Study. The two experimental groups were given the programmed material; Among them, the first group was asked to study on its own, the Second to study with the help of the class teacher; However, the control group was taught by the traditional method of teaching. It was very interesting to note that the group taught through programmed material along with the teacher's help failed to be better. When the time element was taken into consideration, Shah (1964) and Shah (1969) found that the experimental group achieved more in less time. This indicated that programmed learning approach was effective not only in terms of immediate achievement and retention, but also in terms of time taken to learn a particular topic. Apart from the empirical evidence, the effectiveness of the approach was judged by analysing the pupils' reactions. Desai (1966) found that the pupils preferred to study through programmed Learning approach than by the Traditional approach if left to themselves.

The above research findings in Indian context clearly brought out the fact that programmed learning (PL) is more effective than conventional class-room lecture method in terms of students' achievement, retention and attitude and also the method is economic in time.

All other subsequent methods are based on the padagogical principles of PL; but all these methods individualize instruction, which require revolutionary change in school set-up; class-room is the unit of instruction and this unit is found economic in cost and management. Efforts were made abroad to combine PL's qualities with class-room as an unit of instruction without much disturbing the existing school plant. One such method is Keller plan or personalized System of Instruction.

In this reasearch work the researcher's job was to apply the PSI method in teaching Economics at Secondary School level and to find out the results of a quasi-controlled experiment in which the Personalized System of Instruction, or the "Keller Plan" was compared with a Conventional Lecture-oriented class. The comparisons included Students' achievement and attitude and retention of both achievement and attitude.

1.4 Personalized System of Instruction (PSI) :

(a) Concept : The PSI or Keller Plan was developed around 1963 by Prof. Fred. S. Keller with the assistance of his student Dr. J. Gilmour Sherman and two Brazilian colleagues Drs.

Carolin M. Bori and Rudolfo Azzi at the University of Brasilia, in the capital of Brazil. This system of instruction was largely being applied in higher education in the U.S.A., Latin America, U.K. Europe and other countries mainly in three-disciplines — Psychology, Physics and Engineering.

According to Ruskin (1974), the five basic features of the PSI are :

(1) The stress upon the Written word :

PSI places important emphasis on the written word for effective communication between the teacher and the learner. Standard text books are presented in an organized and easily obtainable package. But the content presented as important by the teacher do not always correspond. Hence detailed Study guides are to be prepared by the teacher himself as a key to a specific text book. The PSI Study guides include the important behavioral objectives of learning in the form of study questions. The Usual PSI Study materials bave "introduction" mentioning specific paragraphs, columns and pages of relevant text material.

(2) The Unit-Perfection Requirement :

The necessary content is to be divided into equivalent "units", termed as such by Keller (1968). The standing rule of thumb is that there should be approximately one unit for each week of the course. The unit-perfection requirement states that to advance, a student may "go ahead to new materials only after demonstrating 'mastery' of that which preceded, (Keller, 1968). This 'meastery' concept requires that tests are to be taken by students as many times as necessary on a given unit until a threshold level of mastery is reached. It is the amount he masters that determines his grade.

(3) Student Self-Pacing :

As Sherman (1972b) puts it, mastery is synonymous with unit-perfection. Perfection cannot be controlled by the Calendar and the clock —it demands a self-paced system. We cannot hold both time and quality constant. This leads to another feature — 'Student Self-Pacing".

All the material in a PSI course is unitized and presented sequentially. This means the student cannot proceed to unit 2 of the course work until unit 1 is completely mastered and evidence of this mastery is shown through test performance. The student may choose to wait until mastery of the material has occurred.

(4) The use of lectures and demonstrations as vehicles of Motivation rather than sources of Critical Information :

For effective learning, according to current learning theory, the student needs to be "placed in a position where he must respond, where he receives nearly immediate feedback from his efforts, where he may proceed at his own pace, where punishing contingencies are made minimal, and where his individual work is monitored at every step as he proceeds through a carefully designed sequence of materials requiring an increasingly complex performance" (Sherman 1967).

In the traditional lecture system, the students are passive receptors; naturally they cannot immediately or actively respond to the information. Yet, there are real advantages to utilizing lectures in a total educational system such as PSI. If the teacher lectures well, this should be a highly reinforcing event to the students taking the course. This can serve as motivation to students who know in advance, that, to be allowed to attend they must have reached a certain level in the course.

(5) *The use of Proctors :*

Student Proctors may be advanced students. Keller (1968) describes a Proctor as "an undergraduate who has been chosen for his mastery of the course content and orientation, for his maturity of judgment, for his understanding of the special problems that confromt the student as a beginner and for his willingness to assist".

Some feel that through the unique contribution of the Proctors the PSI gains its truly "personalized" aspect. The student can gain, even in a large class, a highly personalized, one-to-one contact with a fellow student.

The whole system is based on the basic principles of reinforcement of psychology.

The PSI has been successfully tried in a large number of Technical Institute, like the MIT and Worchester Polytechnic in the U.S.A. and North East London Polytechnic in U.K. in teaching science and engineering courses. In India Professors M.S. Rao and C.V. Sheshadri first offered two courses in Chemical Engineering through Personalized System of Instruction in the Indian Institute of Technology, Kanpur in 1971-72.

(b) *Methodology — (uniqueness of PSI)*

It would be reassuring at the onset to note that a PSI format would fit easily into the traditional organisation of our educational system. First, the PSI format would utilize conventional class room facilities and would not require an elaborate physical plant or a special learning centre, and would require the traditional course time limit, which is usually two to three one-hour class per week. Finally, the PSI course would rely heavily on the traditional texts and other written materials. It would be optional to use other media of instruction called 'educational hardwares' which would be costly. So the task of converting a lecture-based course into a PSI course would be interesting and at the same time rewarding.

The conversion of the course to the PSI format, however, would have to pass through three distinct phases — prior to the course, during the course, and after the course.

PRIOR to the course —

A teacher should plan to convert a lecture-based course into a PSI course if the following conditions are valid e.g. if, —

(1) the students are to learn a general body of knowledge and skill in it;
(2) mastery is the object of the course, not to provide just an experience;
(3) the teacher is able to state objectives of his course;
(4) the course does not change too fast;
(5) there is an adequate text book for the course;
and (6) the teacher is *not satisfied with the present lecture method.*

Unlike the lecture course, the teacher should know that now the student would learn almost 100% of what he would offer, he should reduce the items, topics of experiments, too complex and hereby the rule of thumb is to reduce 1/5th of the course. The remaining 4/5th would be the core of his course. At first the teacher would write a study guide to help the students to learn the course. The study guide would break the course into units. Each unit usually would cover a week's work. The early units should be shorter and easy so that the students could successfully pass the tests with less effort and thereby gain confidence and build motivation. Each unit should deal atthe minimum, a concept, a principle, a procedure or an experiment. Students should pass an unit-end test to the mastery level (90% correct responses or answer) to take up the next higher unit. The study guide would be a collection of unit guides.

UNIT GUIDE :

Each unit guide would consist of :

(1) introduction,
(2) objectives,
(3) procedures,
(4) study questions,
(5) written text supplement
and (6) self test.

In the introduction the teacher would comment on the relevant portion of the text book and/or provide a summary or synopsis of the text and inform the students about the importance of the unit.

The objectives would tell the students what they should be able to do as a result of reading the unit.

The procedure would specify the activities which would prove adequate for the student to accomplish the unit objectives.

Study questions would help the student to amplify the objectives and self-test whether he had learnt the objectives fully or not.

Written text supplement would give further (recent) informations on the objectives of the topic.

Self-test would ensure the mastery of the unit to the learner before he could proceed to take unit-end test. Among the units some would be review units; usually every 4th or 5th, 10th or 11th, 15th or 16th would be such units. They should integrate the objectives covered by earlier units.

The unit-end test would be a short test of 15-20 minutes duration which requires 5-8 minutes for its correction. The questions in the test should be a combination of objective type and short-answer type and should cover all the objectives of the unit. Since the students would be eligible to take unit-end test more than once, till they could pass out with mastery on an unit, there should be 2-4 equivalent forms of each unit-end test. Physical science and engineering often would require problem solving and performing an experiment or doing a job, which should be included in an unit-test.

The teacher would then prepare a "Proctor Manual" which should contain —

(1) key to the answers of unit-end test,
and (2) a list of page numbers and other informational material,

that would help the proctor to guide the students, while correcting their own mistakes by themselves. It would also contain for each unit a protocol for a structured interview, while the proctor could quiz the student further, regarding his answers.

Once the course materials - study guide, unit-end tests and proctor manual — could be ready, the teacher would see that the number of test days would be at least 5/8th of the number of units, allowing the students at least two days' opportunity to take test on each unit. The teacher would then prepare a schedule of passing units against class days for guidance of the students. This would be called the Progress Chart. This chart would help a student to become Proctor if progress could be remarkable.

Regarding the gradation of performance e.g. for a 20-Unit course, the completion of 20-units would earn A grade, 18B, 16C and less no grade at all would be the policy and principle.

This principle would apply for 75% of the total grade points of the course. There should be a final examination at the end of the course for rest 25% of the grade points.

Regarding the arrangement of the class, the regular, traditional class room situation would do. At the back, there would be a study circle for the students. The proctors occassionally would check the students to be sure whether they have completed the guided problems and study questions on each unit, he should test and correct the students and announce their mastery of units concerned. Here his Manual would help him. A proctor should be at least 2-unit ahead of his peers.

The teacher would always be present in the PSI class room. The Proctors would submit all the unit tests to the teacher. The teacher would make a progress chart and keep it hanging in the classroom. He should also keep an anecdotal record of each class. This would help him to improve the course. The teacher might arrange occassionally extension lectures etc. He should train the proctors continuously regarding their role to be played.

By a questionnaire, the teacher should know the attitude of the students as well as of the Proctors, towards the course, once at about the middle stage, and again at the end of the course. The teacher should conduct two final examinations, one at the end of the course and another equivalent one, a fortnight before the course ends for those, who had then completed all the units. The advanced students might be deputed on one to one basis to help the backward ones.

When the course would be over, the teacher must study thoroughly the anecdotal record to identify the bottlenecks and take necessary actions accordingly. The teacher should prepare a full report regarding the delivery of the course, its merits and the difficulties he had encountered in the existing institutional infra-structure. He should report students' achievement, their attitude to the course, rewards of proctoring, and if possible, cost-benefit analysis of the PSI course; finally, he should give his own reactions to his course (PSI) and to his role as an instructional system manager.

(c) Advantages of Personalized System of Instruction (PSI) Method.

In comparison with courses taught more conventionally, PSI would demand a much greater mastery of the work assignments, greater memorization of detail, much greater understanding of basic concepts, generate a greater feeling of achievement, give much greater recognition of the student as a person, and be enjoyed to a much greater extent.

Study habits of PSI students would improve during the term; student attitude towards testing would become more positive; one's worry about final grade would diminish, one's desire to hear lectures (to boost motivation or of a specialist on a topic) would increase. It would be sensed specifically that the discussions with the proctors (collaborator) would be very helpful in student-achievement. The PSI method would be one of "Mutual reinforcement".

The following features would distinguish PSI from conventional teaching procedures as stated by (Keller, 1966).

" 1. The 'go at your own pace' feature, which would permit a student to move through the course at a speed commensurate with his ability and other demands upon his time.

2. The unit-perfection requirement for advance which would let the student go ahead to new material only after demonstrating mastery of that which preceeded.

3. The use of lectures and demonstrations as vehicles of motivation, rather than source of critical information.

4. The related stress upon the written word in teacher-student communication.
5. The use of proctors, which would permit repeated testing, immediate scoring, almost unavoidable tutoring and a marked enhancement of the personal-social aspect of the educational process. "

Similarity of PSI with other methods of Individual Instruction also by Keller (1968) could be stated as follows :

1. The same stress would be given upon analysis of the task.
2. The same concern with terminal performance.
3. The same opportunity for individualized progression. But the sphere of action would be different. The principal steps of advance would not be "Frames" in a "Set", but would be more like the conventional home-work assignment or laboratory exercise. The "response" would not be simply the completion of a prepared statement through the insertion of a word or phrase. Rather it would be a resultant of many such responses, an understanding of a principle, a formula or a concept on the ability to use an experimental technique. The use of a programmed text, a teaching machine or computor aid would be entirely possible. This method would involve a personal interaction between a student and his poor.

1.5 The Problem :

(a) Emergence of the Problem :

The subject Economics was introduced in the higher secondary curriculum in Humanities group, one of the seven streams recommended by the Mudaliar Commission (1952-53), as an elective subject, when due to some reasons we reverted back [according to the recommendation of Indian Edn. Com. (1964-66)] to 10 year High School course, Economics lost its previous position as an elective subject and gained the position of an additional subject, which it still continues to hold. It has been witnessed that pupils fail to achieve a good result in this subject. Naturally the researcher was interested to know the source of the problem. If the problem lies with the teaching method then search for a new method, an alternative one, for the traditional conventional lecturing based on lesson plan will have to be made.

(b) Formulation of the Problem :

In India some research works have been done on the PSI (Personalized System of Instruction) by Professors M.S. Rao and C.V. Sheshadri in Chemical Engineering in the Indian Institute of Technology, Kanpur in 1971-72. Bhattacharyya (1976) also had some works in this field (PSI) in TTTI, Calcutta. But all of them worked in the field of higher and technical education and worked successfully. This inspired the researcher to try this Personalized System of Instruction — a method in teaching Economics at school-level so that a better result can be obtained in this subject. The method was tried specially among the girl students.

(c) Definition of Terms in the Problem :

Teaching of Economics in Schools by PSI (Personalized System of Instruction) — an Experimental method.

Teaching :

Teaching as the researcher said earlier would mean giving instruction in certain direction to a group of pupils within a class room on some topic based on lesson plans.

Economics in Schools :

It referred to some elementary and fundamental concepts and principles regarding Economics. About the details of study the syllabus should be consulted.

Personalized System of Instruction :

PSI with its six basic features had been modified by several experimenters to suit the Institutional condition; as such PSI would be a broad instructional system which would accommodate several variations of forms. For the purpose of this research PSI or Keller Plan would mean —

1) Unit Perfection;
2) Students' advance at their own pace for each unit within the class period time limit i.e. 40 minutes;
3) Immediate feed-back after each unit or class period;
4) Unit mastery in Sequence; (1-15)
5) Each unit would have to be briefly introduced by the teacher (a major deviation from the original PSI but needful for Indian context)

only these features of the original PSI were considered and taken.

Experimental Method :

By experimental method it was meant a comparison of PSI with th eConventional Lesson Plan Method in controlled condition (by equivalence of groups).

CHAPTER TWO

REVIEW OF RELATED LITERATURE AND STUDIES

2.1 Major PSI Studies

Keller in his article "Good-bye Teacher" (1968) stated the characteristics of PSI as follows :

" (1) Highly individualised instruction;
(2) Unit perfection;
(3) Students advance at their own speed;
(4) The minimizing of lecture as a teaching device;
(5) The non-commissioned class room device;
and (6) The Commissioned teacher. " (Sherman, p.3)

PSI is a course through which one may move, from start to finish, at his own pace. But one must show his mastery of each unit (by passing a "readiness" test or carrying out an experiment) before moving on to the next one.

In his study Fred S. Keller found that in comparison with courses taught more conventionally. PSI demanded a much greater understanding of basic concepts, it generates greater feelings of achievement, greater enjoyment, improves study habits, increase one's desire to hear lectures, makes attitude towards testing more positive, and diminishes worry about final grades.

PSI differs from other conventional teaching procedures in the following sectors : e.g., PSI allows go-at-your own pace, requires Unit-Perfection, uses lectures and demonstrations as vehicles of motivation, rather that sources of critical information, gives stress on the written word in teacher-student communication, uses proctors which permits repeated testing. immediate scoring, almost unavoidable tutoring, and a marked enhancement of the personal-social aspect of the instructional process.

Keller (1968) continued — PSI resembles other methods of Individual Instruction in the following lines :

(1) The same stress is given upon analysis of the task.
(2) The same concern with terminal performance.
(3) The same opportunity for individualised progression. But the sphere of action is different.

In a PSI News letter, June, 1971. (Psychology Department, Georgetown University) the letters p.S and I have been explained as follows : 'p' suggests some major aspects of the teaching system, e.g., personalized, proctorial, programmed, perfection-oriented, self-paced and "individually Prescribed".

'S is for System, a word that is meant to stress not only a formulated, special method of procedure, but also an integration of student, proctor, and teacher-functions within a unitary whole. "Each participant derives his duties, as well as his rewards, from the activities of the others".

'I' denotes *instruction* which mean a "furnishing with knowledge" or development of a skill. But here the term "teaching" is not used as it is commonly employed, rather it stands for "management of learning".

2.2 Comparative Study of Teaching by Traditional Method and PSI

PSI had been widely compared with the traditional lecture method across different disciplines and grades, at leastin three disciplines — Science, Social Sciences and Humanities.

During the full Semester of 1971, the Mathematics of N.C. State University taught two experimental Sections of M.A. III, Algebra and Trigonometry, using PSI. Each section consisted of 25 students selected entirely on a voluntary basis. The proctors were students selected from the Department of Mathematics and Science education. A common final examination was administered on two experimental sections taught by PSI and two control sections taught by the conventional traditional Lesson Plan (Lecture) method. The experimental sections had a mean of 68 as compared with a mean of 59 for the control Sections.

Ben. A. Green Jr. reported his experience at MIT in Physics teaching with an instructional System designed to exploit learning from the perspective of "reinforcement theory".

(Sherman, J.C. 1974).

(a) Sample : 1000 students.

(b) Procedure : PSI

The results were strongly favourable. Lectures were used sparingly and mainly for motivation; Students might take as many as 20 written tests in a Semester without complaint. Sophomore tutors graded the tests on the spot and had proven to be extremely valuable.

In a paper titled "Student performance in a Keller Plan course in Introductory Electricity and Magnetism", Austin S.M. and Gilbert K.E. reported about a comparison of the performance of a group of 25 students (chosen at random from a larger class) taking introductory physics taught in a Keller Plan (Self-paced) format with that of the larger group of students in the same course taught by the Standard Lecture-Recitation (L-R) method. The comparison was made through a common final examination and also through a retest taken approximately 2 months after the end of the course.

It was found that the performance required of the KP Student to pass a unit mastery test would earn an A if exhibited on the final examination of L-R course. Though KP students did not all do. A level work on actual final examination yet few did poorly.

Jeffrey R. Corey and James S. McMichael have shown (in the context of basic psychology courses) that the retention of the students in a PSI students is superior to that of the Students taught by the Conventional method. Retention tests were administered at the end of the Semester to all students and to randomly drawn samples ten months later.

In the above study the Pearson's T corelations between scores on the original examination and retention test were + .83 for the PSI students and + .69 for the controls. The high correlations between the original performance and retention was consistent with the stress placed upon the mastery aspect of the PSI.

Michael A. Phillippas and R.W. Somerfoldt had a comparative study of Keller Vs lecture method in General Physics instruction of 100 students in each method. It was found that performance was not significantly different and the cost of running the programme was not excessive. But attitude of the PSI students was positive towards the programme.

Lawrence L. Hoberock, Billy V. Koen, Charles H. Roth, and Gerald R. Wagner tested PSI for engineering education (1972) in courses in nuclear, mechanical, electrical and operations research engineering at the University of texas at Austin. From experimental data and observation it was found that students took advantage of the unique features of PSI and adapted them to their own needs; that they enjoyed learning by this method, and that they learnt more than in conventional courses. Results obtained indicated that the self-pacing and unit perfection of PSI were extremely appropriate for engineering education, that the emphasis on written word learning and the use of proctors were definite assets; and that the motivational lecture feature was of lesser value.

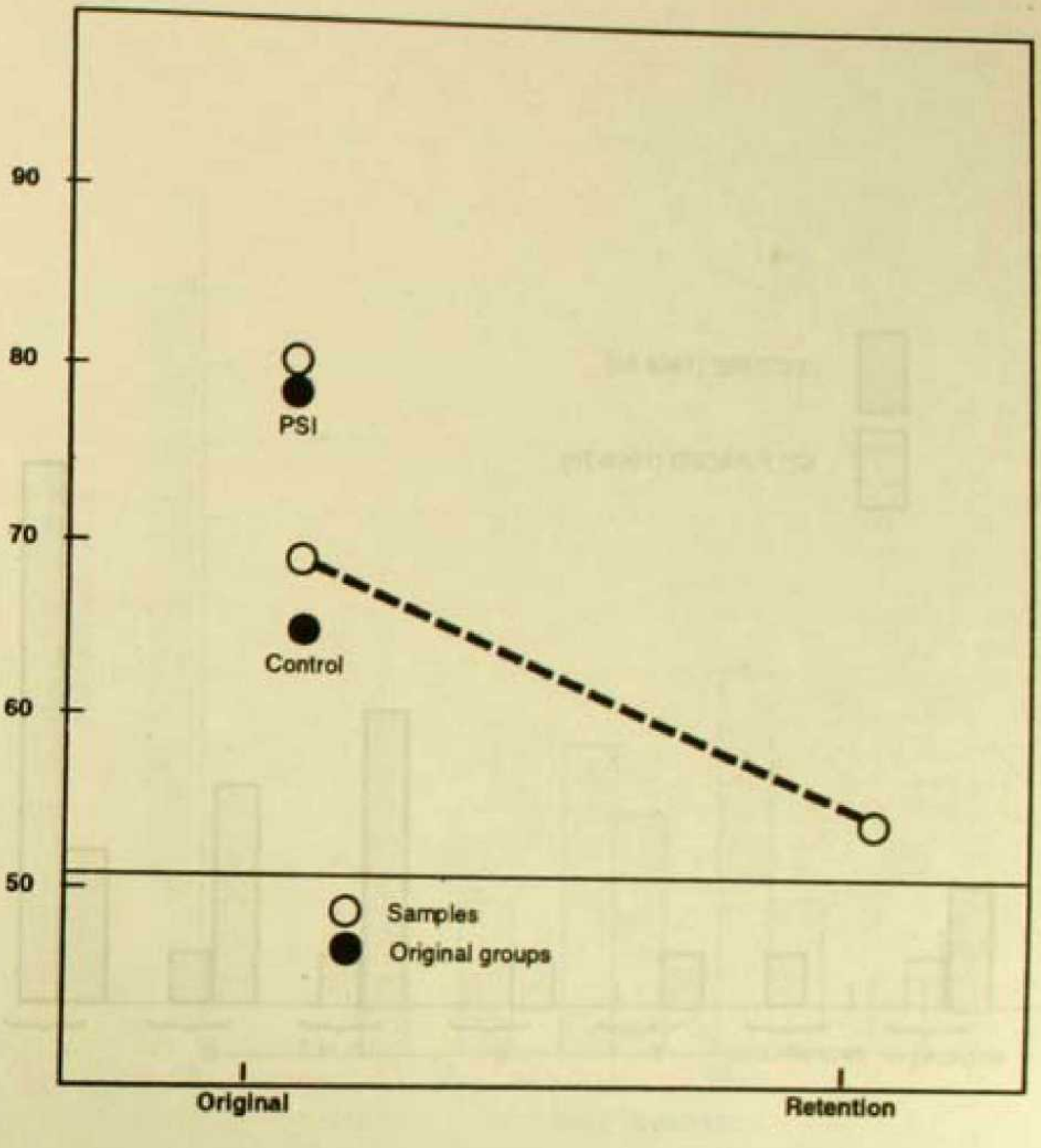

Figure 2.1

Retention scores as a function of teaching method and test time. The filled circles represent the mean test scores of each class at the end of the semester. The open circles represent the mean test scores of randomly drawn samples of students at the end of the semester and ten months later.

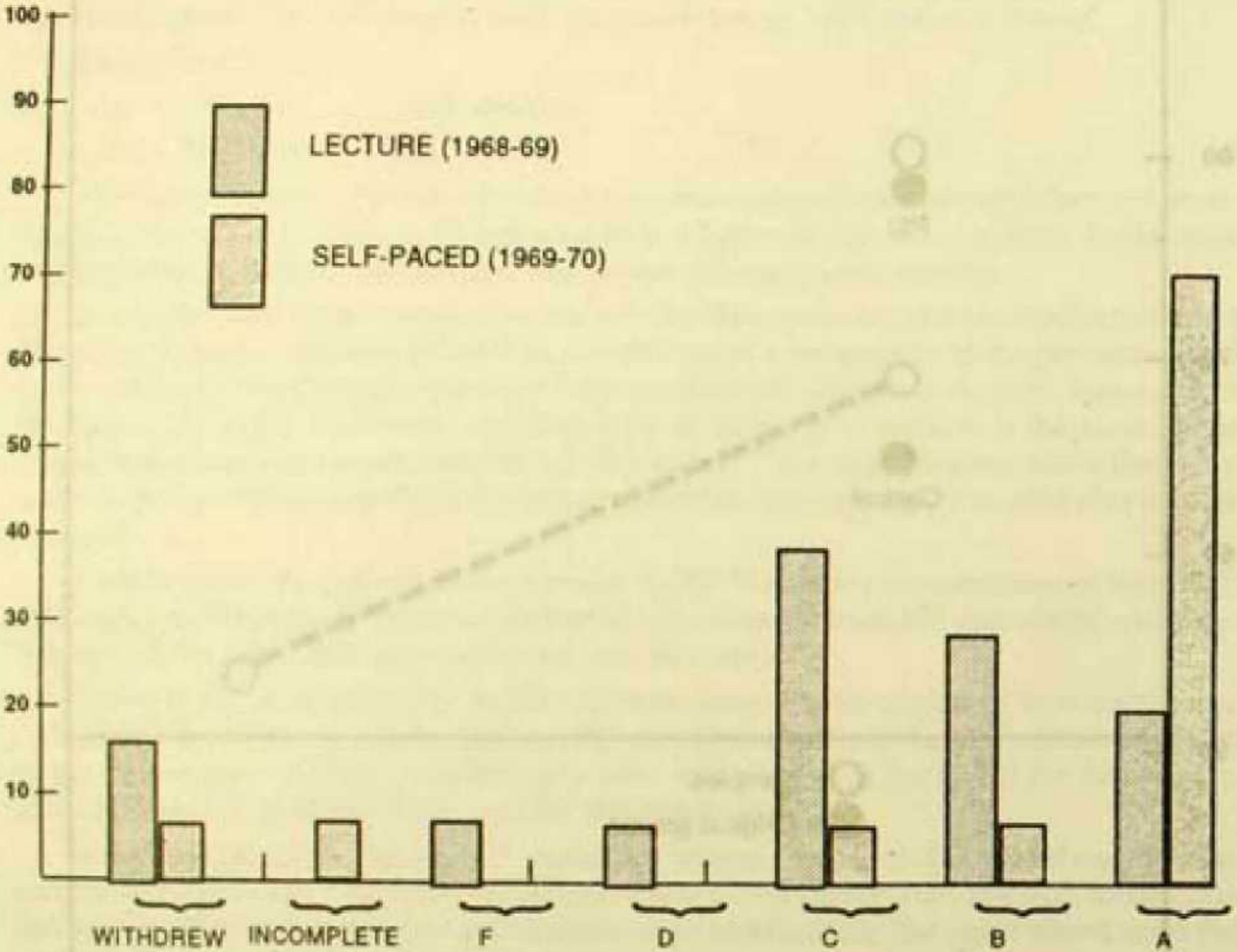

Figure 2.2

Grade distribution for lecture and self paced classes.

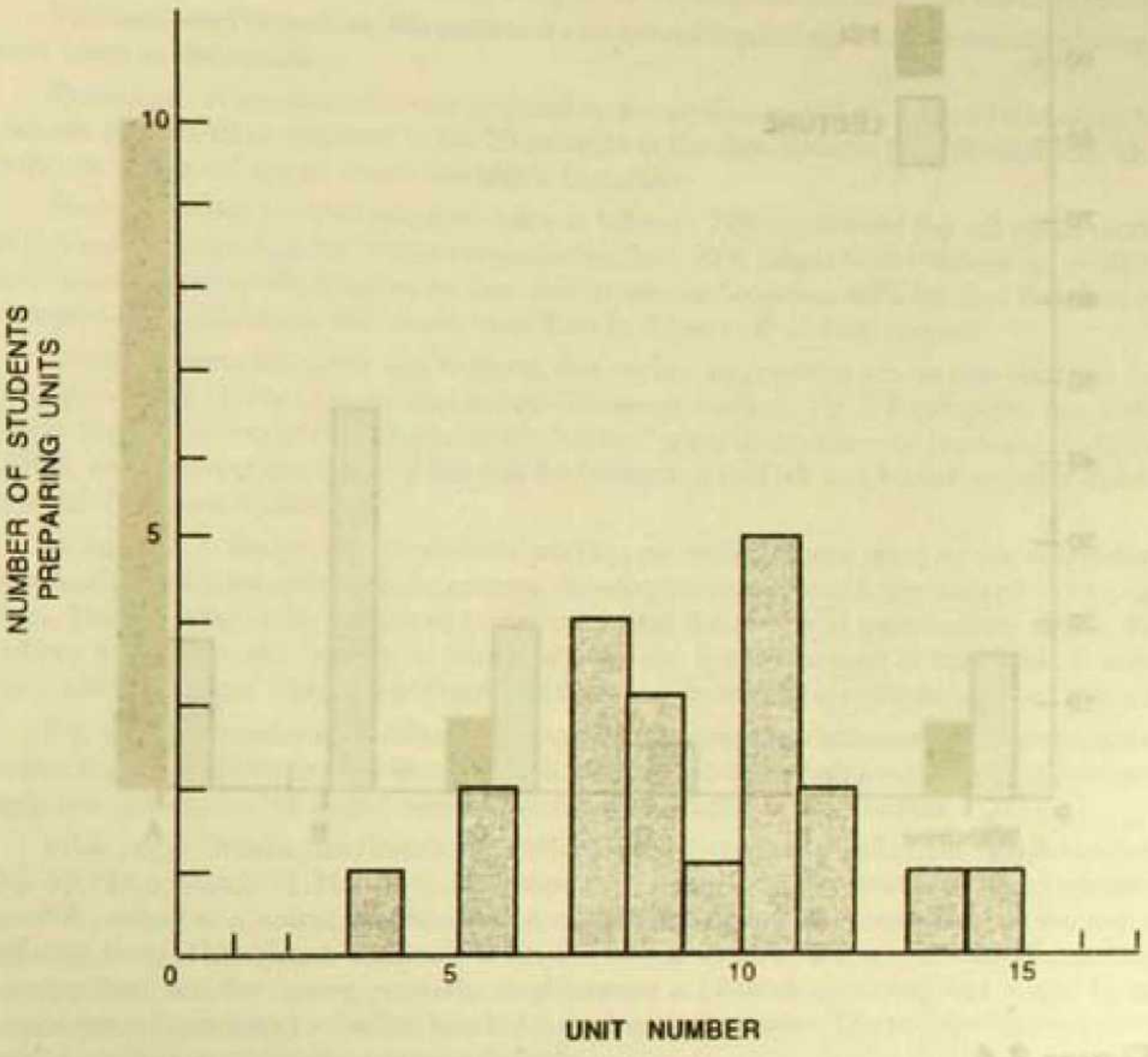

Figure 2.3

Student distribution with unit number at a point two-thirds through the course.

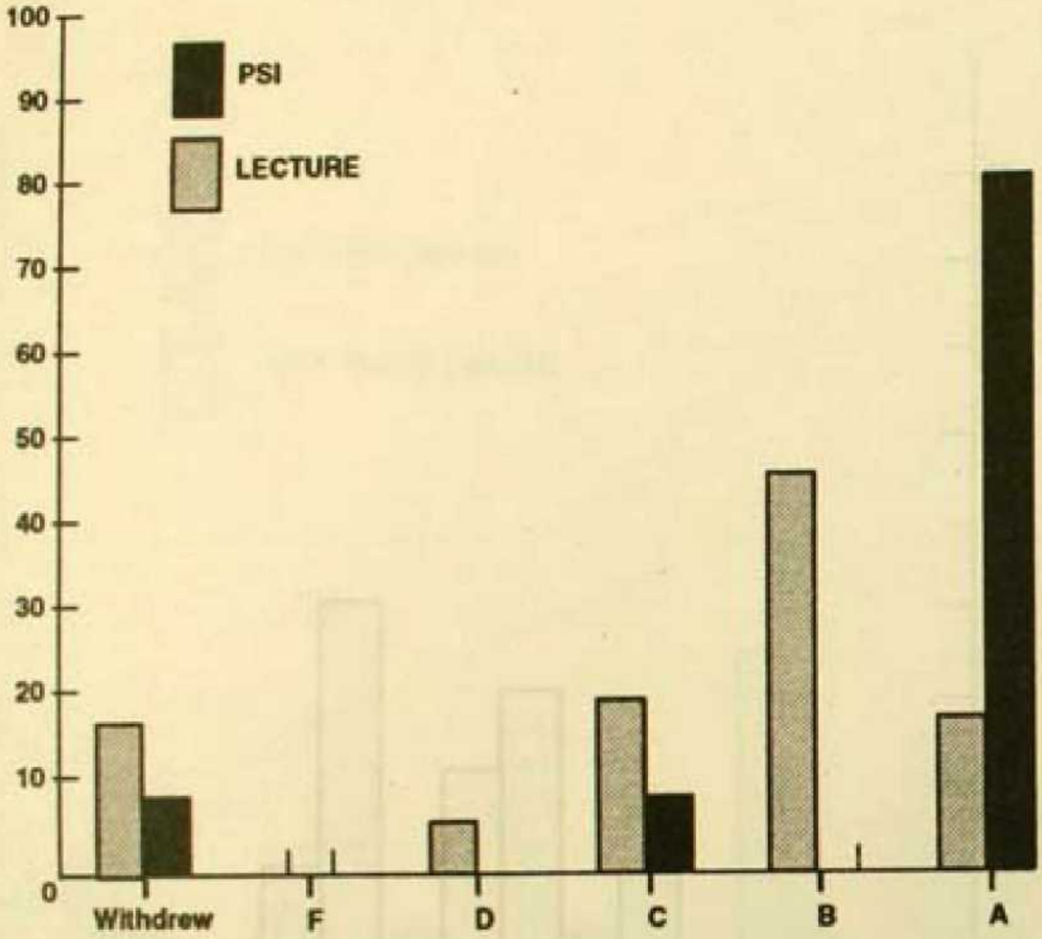

Figure 2.4

Grade distribution for both PSI-taught and Lecture-taught classes in the same mechanical engineering course.

Let us now examine a paper entitled "Self-paced Instruction for Engineering Students" by Koen, Billy V. Published in *Engineering Education*, vol. 60, No. 17, March, 1970.

PSI was used in a senior level of nuclear engineering course at the University of Texas with great success as judged by student learning, motivation and enjoyment. This article gives an example of the results that may be obtained by using modern learning theory in the class room.

Tool used was PSI method. 20 students of educational Psychology of the University of Texas were taken as the sample.

Procedure : A questionnaire was prepared by the professors in Educational Psychology to evaluate the attitudinal response fo the 20 students in the class towards the PSI meethod. The response to this self paced course was highly favourable.

Student-answers to other questions were as follows : 72% considered the self-paced mode of instruction better than the lecture-discussion method; 22% judged both methods equal; 88% considered that their effort was more than that in standard courses; 88% felt that they looked forward to the activities in this course more than to those in all of their courses.

Using the same Instructor and textbook, this nuclear engineering course was taught in the preceeding year by the conventional lecture-discussion method. Fig 2.2 compares the grade distributions of the two groups. The extremely "skewed" grade distribution was predicated by Keller (1968), and it existed inspite of the fact that the instruction staff felt that the self-paced studentts covered 20% more material.

In figure 2.3, the number of students working on each unit was given as the distribution appeared 2/3 of the way through the courses, showing the wide spread in the students in a typical class. The flexibility of the self-paced course minimized the effects of quizmanship, illness, the folklore as to the student's ability in the department etc. It was also next to impossible to cram for this kind of course. The grade of A signified that a certain amount of material had been learned.

Fig. 2 also pointed out the difficulty in attempting to prepare a lecture at this juncture in the course that would fit the level of learning of all students. A student who would finish this course early was not required to attend class and was free to study his other courses.

In his paper "Personalized Instruction in Mechanical Engineering" in Engineering Education, Vol. 61, No. 6, March'71. Hoberock, Lawrence, L. presents and interprets the results of applying the PSI method to a course in mechanical engineering, taught under circumstances somewhat different from other known applications i.e. the course required a large amount of graphical construction; and the course, normally taught during a 14-week semester, was taught by an inexperienced instructor for the first time in a 6-week summer session. The problem then was how best to conduct an unfamiliar course in 6-weeks.

The text book and the material covered were essentially the same as used in previous courses taught by other instructors. The unit perfection requirement measured by tests that required as thorough a mastery of the material as in earlier courses, supported the view that the students did learn by the PSI method. 64% of the students felt that the PSI-taught course was better than the traditional lecture course and 18% felt that it was equally good. It was therefore decided to compare the grade distribution with that of a representative previous clas to indicate the learning effectiveness. Fig 2.4 presents this comparison.

Comparing this course with others that the student had, 60% looked forward more to the activities of this one and 45% considered it one of the best; 54% put into the course well above average effort, and 45% said that they got more than they had expected from this course. One student said, "This course is great, because for the first time in my curriculum, I can take the time to really learn the material". In particular, the researcher realized for the first time that students could learn much more effectively in many cases, if teachers could "teach" less and motivate more.

Mckean H.E., Newman F.L., and Purtle Ronald (1974) taught student by PSI method a three-semester Mathematics and Statistics Servic Sequence and gave their opinion in favour of PSI in comparison with the traditional lecturing.

As a mathemetician concerned about creating an adequate and meaningful service sequence for the social and biological sciences, McKean had been concerned about several facets of the traditional lecture approach to staffing and teaching this service sequence. Few of the students taking the sequence really liked mathematics; because the student attitude was relatively negative and mathematical aptitudes largely minimal. Most faculty members would avoid teaching the sequence like the plague. When "trapped" into teaching such a course, the presentation was often sterile. As a result, performance levels were marginal. This resulted in grading on a curve where 45 to 50 percent correct might well mean a passing grade. In view of the fact that we had tried to construct our tests to cover the material essential to the students' future needs the curve was not appropriate. Mathematical and statistical skills transferred out of the course were minimal, Furthermore, the professor — student interaction was distant at best. When Fred Newman suggested some of his ideas, nearly all of the aforementioned objections were removed; the learning model he proposed was intuitively appealing, and the idea that the system required students to demonstrate near-perfect command of the material had a ring of academic integrity.

The discussion would lead to a "report on the use of the Keller Plan in a General Biology course at Lowell State College" by Paul.Protopapas. (1974). 32 students enrolled in the general biology course during the full semester. The method of course presentation was based on the self-paced instructional programme introduced by Keller. The course material was divided into 14 study units each accompanied by a unit examination. The general biology course, two semester hours, was assigned two 5-minutes period per week. The students in the keller Plan were required to arrange an additional hour per week with their tutors. The students used this extra hour for tutoring and for taking examinations. No lectures were given under the Keller Plan. the students had access to audio visual material in addition to tutoring. The study units consisted of a brief introduction, a list of objectives, student activities, and study questions. If a student finished all 14 units his grade would be A; 13 units, B+; 12 units, B; 11 units, C+; 10 units, C; 9 units, D. 75% of the final grade was determined by the student's perfprmance on the unit examinations. The final examination comprised 25% of the final grade.

Of the 32 students taking the final examination 16 had completed all 14 units, 20 had completed 13 units, 31 had completed 12 units, and all 32 students had completed 11 units. No student withdrew from the course and no student received an Incomplete grade. The final examination was one given by another instructor to her lecture section.

A comparison of the two classes is shown in Table 2.1

TABLE — 2.1

%	A	B	C	D	F
Keller Plan	20	40	40	•	•
Lecture Section	4	16	41	16	16

A comparison of the final grades earned in the course between all lecture sections and the Keller Plan students is shown in Table 2.2

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TABLE — 2.2

%	A	B	C	D	F	I
Keller Plan	34.4	50	12.5	1	X	X
Lecture (297 students)	5.4	23.8	41	21.8	7	1

The researcher would now have a comparative study of the two methods and their relative superiority in teaching Chemistry. A paper about this was submitted by Lao Michahwei Ming (1973).

In the fall of 1971, the first Keller Plan course was tried experimentally in the Freshman Chemistry class at Barrington College on a voluntary basis. The following findings should be noted

Because of the built-in-nature of the system the grades of students did not follow a normal course with a few A and B students, and a majority of C students, but the numbers of A and B students were greatly increased. Students' reactions toward the Keller Plan had been most favourable. The uncertainty and worries of the administration were changed into cooperation and encouragement as good responses from students become evident.

Test scores as a function of instructional method and retention under the two methods could be given below :-

	Original	Retention (after 10 months)
PSI Group	80% — 90%	60% — 70%
Lecture Group	50% — 60%	30% — 40%

Comparison of PSI and Lecture — Humanities :

The comparative study of PSI and the traditional method and its relative efficacy in teaching the Humanities group may now be surveyed. Here, first would be discussed a paper published by Stanfield Elizabeth Poplin (1974). The title of the paper is "Experiment in Individualized Learning At Georgia State". It dealt with an experiment of the latest step toward innovative method in the Foreign Language (FL) class room by a department which had pioneered multipurpose use of the language laboratory and a two-quarter intensive Spanish course for those wishing to complete four quarters of work at Georgia State University. It was a three-quarter excursion into individualized instruction in basic Spanish.

Tool used was Individualized Learning Systems (ILS) of San Rafeel, California. Sample taken was FL class room of Georgia State. The instructional method employed was directed towards qualitative improvement in the results of his study.

Classroom procedures were not teacher dominated, but gave stress on student interaction in groups of seven or eight.

The course consisted of 24 units. Both the instructor's guide and the student's guide contained dialogues and monologues for memorization and small scale replicas of the posters to facilitate memorization on an association or image building basis. In addition, there were 24 tapes for language laboratory use and 32 colour posters for use in presenting the dialogues and monologues to be memorized. There was an instructor's manual showing how to set up an individualized classroom on either of the two systems :

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a) "Peermanaged"

or b) "Proctor — managed".

Essentially, ILS has attempted to provide the student material for learning Spanish grammar on his own, freeing the teacher and aides to concentrate on developing each student's Verbal facility in the new tongue.

A typical five-day lesson sequence proceeded as follows :

1. The instructor made the initial presentation of the dialogue to the entire group using all the techniques familiar to the audio-lingual specialist. After a fifteen-minute presentation, the clas broke into predetermined groups to continue practising the dialogue (monologue) patterns. As more control over the material was gained, questions based on the dialogue were introduced by the group leader (instructor, aide, or peer). Oral expansion of the dialogue patterns was encouraged by the use of synonymes and antonymes as practice continued on the second and third day.
2. The instructor taught orally whatever grammar strucures occurred in the dialogue, if they were included in the programmed text.
3. Small group oral practice, expansion, dictation of dialogue (monologue) material; grammar, vocabulary.
4. Small group oral practice, expansion, reading selections; oral comprehension test on dialogue or monologue.
5. For devoting extra time to difficult constructions or a short in class, written composition to assess achievement or a free expression oral composition both based on one of the series of independent practice posters.

With each new lesson introduced a vocabulary sheet was distributed containing all items mentioned in the dialogue, monologue, and programmed text.

To show mastery of each grammar unit, a student had to prepare two short compositions. The first appeared in sentence fragments at the end of each unit, and must be unscrambled and arranged in logical order to form a coherent paragraph. The second was his own original paragraph patterned after the composition accompanying the unit. These were read by the instructor, corrected, commented, graded and returned to the student with suggestions for further study, if indicated.

Learning options unique to this programme included admission to the language laboratory at any half-hour interval from 8 a.m. to mid-afternoon and access to tri-weekly small group or individual tutoring sessions, individual problems arising from the programmed texts could be attached.

A four-fold testing system measured oral comprehension speaking fluency, sight reading ability, and grammar mastery. The student's final grade was based on a numerical average in these areas. Ideally the evaluation of student progress would be an individual session between the instructor and a single student, but even experimental courses must bow to realities of the academic world and, at this moment final examinations and grade sheets for the Registrar's office were included among these inescapable facts of life. In May, the Modern Language Associations Reading Test would be administered to ILS students along with their encounterparts in more traditional classes of Georgia State. As a growing number of instructors have already discovered. Mrs. Stanfield hoped to find that individualized instruction would enable students to learn more with better comprehension and better retention — than other methods. The "bonus quality of the program was that students had enjoyed learning the language.

Four departments at East Stroudsburg State College offered courses utilizing the PSI format : Chemistry, English, Physics, and Psychology. The English Department had judged successful its PSI approach to the teaching of basic English Composition Skills. The course involved completion of work sheets on ten units dealing with such topics as verbs, pronouns, punctuation and paragraphing, followed by mastery tests. Two faculty members and five student tutors were available 20 hours a week. Their reaction to the approach had provided valuable guidance to the next restructuring of the program.

Bacause of the number of students needing remedial work, the PSI Approach to its teaching promised to solve a major staffing problem of the department. Sections of PSI skills could handle two to three times the enrolment of convertional sections. approximately 25, yet not deprive the student of the personal attention he needs.

Another report on an English course revealed that students were no longer "condemned" to a "bonehead" English at American River College, Sacramento, California, because four instructors — Robert Frew, Richard Guches, Robert Mehaffy and Helen Mills — had made sentence writing and paragraph writing integral parts of the sequence leading toward effective composition writing by individualizing instructions, and meeting students at their level of accomplishment. They evolved this productive programme by writing self - instructional units based on objectives, by permitting students to work at their own pace and to enter and leave their classes at any time during the semester, by changing their roles from lecturer to diagonostician, tutor, and counseller, and by bringing tutors into their workshop sessions. Progress through the courses depended on mastery of a unit before going on to the next. As a result, no one can fail. Evidence of the success of the program is that students, even those who have always hated English, express satisfaction as they develop experience in learning subject matter in depth and helping students understand it, and instructors believe that they are helping students more effectively than they could in conventional classes.

Berry G.D.W. applied a varient of the Keller Plan (Proposed by Ferster and Perret in 1968, based on a succession of oral interviews) in introductory Philosophy courses, and proved the efficacy of the Keller Plan in teaching subjects outside sciences (1971).

31 students of philosophy at Boston University during the summer of 1971 were taken as the sample. The findings were as follows : four out of 31 found the whole interview method repugnant to them and completed less than 16 interviews, 24 completed all the 28 interviews and of the other three, none failed to complete more than four interviews. The final box score was 24 A's, and A — 's, 3 B's, 2 C's, one D and 1 F. Graphed, this would resemble the upper half of a normal curve inverted.

The interviews showed with remarkable unanimity a clear recognition of the difference between a good argument and a bad one.

Moreover, most students enjoyed the course. they learned both by teaching and by being taught. Whatever variations of the Keller method would prove most successful in teaching mathematics and the natural sciences should, with minimal adaptions (e.g. a reversion from the student — interview dominated approach of Ferster and perrot to original Keller Plan of using extensively professional or quasi-professional proctors) should serve equally well in teaching logic.

In 1974-75 academic year, the Department of History and Philosophy of Carnegie — Mellon University conducted a study to determine the feasibility of PSI in undergraduate history. The followong answers were sought :-

1) Is PSI a workable instructional strategy in undergraduate history ?

2) To what extent can students master the knowledge and skill objectives of a specific undergraduate course in history using PSI?

3) To what extent do they like or dislike the content of a course taught by PSIU? The department wanted to test the classical PSI format. The course was an introductory, one semester course in African history.

The course was divided into 20 units of varying lengths. The initial unit required less that 30 minutes to finish. Other units required two to four hours for completion. Units 8 and 13 were review units and the final unit consisted of preparation for the final examination for the entire course.

Mimeographed study guides were written to direct the students through each unit. Three forms of each unit test were prepared. Students were required to get 85% of their responses correct on a unit test in order to achieve history. The student-proctor ratio was 11-1. Audio-visual materials for individual study, proctor's tutoring and remedial help were available. Three large group-lectures were schedule during the 5th, 8th & 11th weeks of the 13 week semester.

Students were required to complete all the 20 units and to pass at a minimum 80% mastery in a final examination in order to receive a final grade A. The examination was administered three times during the final month of the course, a different form being used each time.

32 students were enrolled in the PSI Section; a quasi-experimental design was used conducting pre and post course evaluations using comparable outside classes as controls. Thus while this arrangement prevented the researcher from making a useful statements about the comparative impact of PSI in history as she had hoped to make, the design did serve the major formative evaluation purposes of this study quite adequately.

Of the 32 students, enrolled, in this experimental course, 24 completed all course work and the final examination by the end of the semester.

Fig. 2.5 Performance Measure of Students in PSI course

	Measure	Total Class		Students receiving final grades or drop			
		Avg.	(n)	A n=17	B n=7	I n=4	Drop n=4
	African History						
55 Items	Pre-test	23.56	32	26.29**	21.29	20.75	18.75
	Post-test	41.58	24	44.29**	35.00	X	X
	Gain	16.75	24	18.00	13.71	X	X
	Problem-Solving						
40 Items	Pre-test	20.41	32	22.12**	18.14	19.75	20.41
	Post-test	27.04	23	27.24	26.50+	X	X
	Gain	5.76	23	5.12	7.67	X	X

** Significantly higher than scores for B students.

+ N = 6

A gain of 16.75 represented a substantial gain in Knowledge about African history for students in the PSI course.

As Fig 2.5 also indicated students in the PSI course increased their knowledge of problem solving and its specific skills. On the 40 item instrument, the class as a whole recorded a gain of almost 6 points — about 28% between the pre and post-test.

Fig. 2.6 Performance Measure of Control students on Problem — Solving Test.

Measure	Control Avg.	Class 1 (n)	Control Avg.	Class 2 (n)	Total Avg.	(n)
Problem Solving						
Pre-Test	23.92	12	22.91	11	22.43	23
post-Test	25.5	12	23.27	11	24.43	23
Gain	1.58	12	.36	11	1.00	23

Fig. 2.6 provided performance data on the problem-solving test for students in two comparable freshman history (Western civilization) course, where historical problem solving was an implicit part of the curriculum. These data indicate that students in the experimental course significantly increased their knowledge of problem solving during the course whereas those in the control classes did not.

These data also would reveal interesting differences in performance between students who received final grades of A and students who earned B's or I's.

On the History post-test (final) A students performed considerably better than B students. In terms of the difference between pre-test and post-test scores. A students showed somewhat greater improvement over the semester, but the difference was not statistically significant.

For the problem solving measure, there were no significant difference between final scores for A and B students. Interestingly enough, however, the B students improved sufficiently in the problem-solving post-test to eliminate the significant advantage held by the A students in the pre-test. Of even more importance, this gain greatly surpassed the slight gains made by the control groups. Though neither control class emphasized a specific problem-solving approach in the same degree as the experimental class, both control classes did stress historical reasoning. Since the 23 students from the control groups who took the pre-test and post-test in problem-solving had initial pre-test scores comparable to these of the A students in the experimental course, the experimental group gain seemed quite noteworthy. Hence these data should suggest at least a tentative answer to one of our guiding questions : Students could learn historical knowledge and selected skills in history using a PSI approach.

In general, the students in this PSI course responded quite favourably to PSI as a mode of instruction in undergraduate History. A number of students even expressed interest in serving as proctors in the course were it ever offered again.

Regarding "Procrastination-problem", data confirmed steady rate of speed of the students through the course who completed the course by the end of the semester. (Bayer, B.K. & O 'Toole, T. 1975).

Practice Teaching :

Practice teaching is a component of our teacher education programme. But the Indian Education Commission (1964-66) expressed its dissatisfaction with the present system of Practice Teaching. It said : ;"At present, student-teachers are commonly required to give a specified number of isolated lessons, many of which are often unsupervised or ill-supervised. The practice of continuous block teaching, the duration of which varies from two to six weeks, is adopted only in a few institutions and its organization still leave much to be desired".

The main emphasis in the conventional practice programme is on the skill of communicating subject matter information to the pupils. This alone will not achieve the objective of bringing about a change in the modification of the teacher behaviour.

Griffith and Moore (1967) found that student teachers would improve during practice, but there was difficulty in specifying the improvement. Skills and techniques were the basic pre-requisites for putting into practice any teaching method or approach to a subject (Bishop and Levy, 1968). Moreover, feedback was not adequate and systematic in Conventional Practice teaching. Lack of adequate feedback had ploughed teacher training for centuries (llanders, 1967).

Perterson (1973) also argued that "In the traditional student teaching programme the amount of actual teaching experience, quality and quantity of supervision, and the kind of behaviours that are modelled depend almost entirely upon the whims of supervising teacher". (p.34).

Palsane and Ghanchi (1967) surveyed the Practice teaching programme of 62 colleges. They observed that :

(1) the number of lessons to be given by a trainee is fixed arbitrarily without taking into consideration individual needs and abilities);

(2) there is a lack of adequate orientation programme for initiating practice teaching;

(3) the trainees do not get practice in teaching continuous units and they have no scope for developing dynamics, initiative and resourcefulness as teachers;

(4) the assessment of student-teachers is not continuous and integrated which could carry further the needs of progress;

and

(5) the training colleges and schools need to come closer and co-operate in planning programme for student-teachers.

It is no denying the fact that our Conventional Practice teaching, has impact on teacher training. It has its own way of feedback although it lacks specificity and objectivity. It is also true that no thorough review of studies of the effects of Practice teaching on developing skills of teaching or attitude has yet been done to show conclusively that it is ineffective. But it needs serious consideration to make an attempt to modify it.

2.3 Teaching Economics by PSI.

A paper "PSI versus the Lecture Course in the Principles of Economics; A Quasi-Controlled Experiment" by Donald B.Billings (1974) reported the results of a quasi-controlled experiment in which the Personalized System of Instruction (PSI) or the "Keller Plan" was compared with a conventional lecture-oriented class. The experiment involved the sophomore level Principle of Economics course and the comparisons included performance of learning, student attitude and an analysis of student attributes and their impact on performance in a PSI course.

The pre-test/post-test instrument was the test of Understanding College Economics (TUCE), which had national norms. Students indicated a fairly strong favourable reaction to the PSI package in a post-course attitude and evaluation survey. Tests were run on the difference in the mean improvement between the pre-test and post-test scores and while the absolute improvement in the experimental PSI group was larger than that in the control group, this differential was not significant. Stepwise multiple-regression techniques were employed to ascertain which student characteristics were significantly related to student performance in and attitudes toward PSI.

Cost-Benefit Analysis :

Anyone planning a Keller course should estimate the cost, and the most important element of cost is the manhours needed for monitoring sessions. It might be reasonable to ask "How can we afford Keller with our large class ? "Some think that it might be possible to plan more intensive tutorial support for a lecture course, which might cost less than Keller, but yield significant benefits.

But this generalisation would not provide a tidy way of replacing a lecture course. In general, the replacement of a conventional lecture by a self-paced course would involve little or no increase in manhours per week for a class of ten to fifty students. So at secondary level as one need not have to invest as much manhours per week as in a higher level, one could prescribe the introduction of the Personalized System of Instruction (PSI) method to testify its superiority over the conventional traditional lesson plan method of teaching.

2.4 Cost Benefit Effect of PSI :

An accepted definition of cost-effectiveness analysis would go like this : It is that procedure by which the costs of alternative means of achieving a stated effectiveness or conversely, the effectiveness of alternative means for a given cost, are compared in a series of numerical indices. The objective of the analysis is to isolate the alternative or combination of alternatives that either gives the greatest expected effectiveness for a given expected cost or a given expected effectiveness for the least expected cost.

To consider the benefit side first, a recent review of research on PSI confirms that :

1. PSI is an attractive teaching method to most students.
2. Self-pacing and interaction with tutors are the features most favoured by students.
3. The conditions that influence withdrawal and procrastination can be controlled through course design.
4. Content learning, as measured by final examinations, always equals and usually exceeds, performance in lecture sessions.
5. Students often put more time and effort into their PSI Course.

When PSI seems to present a clear superiority over conventional teaching techniques why are so many courses still being taught by lecture and lecture-discussion (traditional) methods? This leads us to consider the cost side of PSI.

— 1. Mastery is not the object of our course.

— 2. There is no adequate text for this course.

— 3. Students have a variety of cognitive modes and they may vary for the same student in different subjects.

— 4. Often the entry costs (start up costs) for PSI are high.

— 5. The cost of change to the institution.

— 6. The cost of change to the instructor.

If one could lump together all factors involving expenditure of time and effort, as well as money, one can translate all inputs to instruction into a cost component. Regarding output two identifiable outputs — (1) achievement and (2) attitude are needed. The traditional wisdom places a low or negative value upon positive student attitude (non-cognitive) toward a particular subject.

The allocation of certain costs will depend, however, upon the nature of the school and students.

CHAPTER — THREE

DESIGN, METHOD OF ENQUIRY AND METHOD OF ANALYSIS OF DATA

3.1 Research Design and Procedures :

The objective of the study was to explore the usability of personalized System of Instruction (PSI) in teaching Economics to students in India at School level. The students normally study Economics, like other subjects at school level by the traditional system i.e., the lesson plan method. The studies of Keller and others had shown the usefulness of PSI in teaching Science, Social Science and even humanities in the USA, the continent and also in many parts of the world. In India, no such study has yet been taken in teaching Social Sciences, more particularly in Economics.

With the above background in view, the design of the experiment was made, sample taken, research hypotheses built and data collected.

The same teacher taught two equivalent (of the same standard) groups of students of class IX for 40 minutes; one group by the CLP (Conventional Lesson Plan) method and the other group by the PSI (Personalized System of Instruction) method.

The method of inquiry adopted was to compare the effects of two different forms of experimental variables (PSI teaching and CLP teaching) on the learning outcomes of two equivalent groups of students.

(a) Selection of Teacher :

Following procedure was adopted in the Selection of the teacher, who taught the students once under the PSI method and again through the CLP method.

First a questionnaire was administered on the B.Ed. trainees (N=40) of a B.Ed. College in the district of Hoghly, as regards their personal statistics like age, teaching experience, qualification, etc. Ten trainees having almost equal age, teaching experience and qualification were then primarily selected. Then out of the ten, four were selected by personal interview for our purpose. The researcher observed the classroom teaching of these four trainees under both the PSI as well as CLP method for 5 days. Three teachers were found by the researcher who treated the two methods with equal justice. Then the Supervisor and the researcher jointly observed the teaching of these three teachers in the two methods by global ratings and agreed about two who did equal justice and adjudged above average in teaching competence. Then one was selected for the study and the other was kept as stand by in case the first one may have to discountinue for some unforeseen circumstances.

(b) Sample :

The students 50 in number were taken as sample from Class IX of a school situated at Chandernagore in the District of Hooghly. Almost all the students came from the same locality and belonged to the same age group 14-15 years. These 50 students were divided into two equivalent groups :

1) the PSI group

and 2) the CLP group

on the bsis of their last annual (school) examination. The two groups were then taught separately by the same teacher. Equal importance was given to the treatment of both the groups.

(c) Lessons :

Each group had been taught 15 lesson units; for the CLP group 15 lessons were built following the lesson plan method. For the PSI group 15 PSI units, suggesting the gist of every lesson, were built. Each group had each class of 40 minutes duration.

(d) Syllabus :

I. The nature of economic activities.
II. Economic Activity of the household —consumption.
III. Production — the concept of the firm-classification of factors of production and their earnings.
IV. classification of firms : Single ownership, partnership, joint stock companies. Co-operation-different types of co-operative societies. Small scale and large Scale production.
V. The market — Demand and Supply — Elastic and Inelastic demand—Elastic and Inelastic Supply — Price and output of the firm under perfect competition and under monopoly.
VI. Money — functions of money — Description of the banking system (commercial and Central banking).

Topics covered as Lessons/Units in the study were as below :

1. Definition of Economics (Lesson Plan No.1).
2. Subject matter and Scope of Economics (Lesson Plan No.2).
3. Some fundamental economic concepts. Goods, Wealth, Income, Expenditure, Utility, Investment, Production, Consumption, Exchange, Market, Value and Price, Want (Plan No. 3-5).
4. Law of Diminishing Marginal Utility (Lesson plan No.6 & 7).
5. Economic Activity of the Household — Consumption, doctrine of Maximum satisfaction. Consumer's surplus (Lesson Plan No. 8 - 11).
6. Production and Firms (Lesson Plan No. 12).
7. Factors of Production — Land, Labour, Capital (Lesson Plan No. 13-15).

(e) Procedure :

The CLP group was taught by the teacher in the conventionaly way following lesson plan. However, the PSI group was served with a study guide and a mastery gate for each unit lesson Both the groups had to pass one post-test on each unit so that they can switch over to the next. The answers are being scored. In this way 15 lessons were being completed. One comprehensive post-test (named comprehensive Test I) and one Attitude Test (named Attitude Test I) were then being administered on both the groups on the day immediately following the completion of the 15th unit. A gap of 14 days was allowed then. The same comprehensive test and Attitude Test were again being administered on both the groups to test retention. Answers were again scored. So in all, 19 post tests (e.g. 15 unit-end tests, 2 comprehensive Tests, 2 Attitude tests) were being administered on both the groups. Raw scores of both the groups were then tabulated.

(f) Statistics used :

Students of both the groups (PSI and CLP) had been grouped into three categories : Good (G), Medium (M) and Poor (P) on the basis of their last annual examination.

Mean Values of all the three groups (Good, Medium and Poor) of the both the methods were being calculated by computer. Then the ANOVA of the data to obtain SS, MS and F of inter group each day of groups G, M, P & Total (T) under each method (PSI and CLP) was being done to find out the significance of difference at .01 and .05 level, to test the superiority (if any) of PSI over the conventional Lesson Plan method of teaching.

(g) Variable Paradigm :

It is given in Diagram

Variable Paradigm

	Experimental Variables	*Criterion Variables*
Achievement	Unit-end Tests (No. 1-15)	PSI method of teaching.
	Comprehensive Achievement Test (No. 1)	LP method of teaching.
Attitude	Comprehensive Attitude (Test (No. 1)	
Retention (after 2 weeks)		
Achievement	(Comprehensive Achievement Test score difference between two administrations in 2 weeks' interval)	
Attitude	(Comprehensive Attitude Test Score difference between two administrations in 2 week's interval).	

Diagram : 3.0 The Variables used in the Experimental Studies.

3.2 Research Hyupotheses :

H — 1 : 1 In unit-end Test I, the results of the PSI group will be *better* than those of the Conventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 2 In unit-end test II, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 3 In unit-end test III, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 4 In unit-end test IV, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 5 In unit-end test V, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 6 In unit-end test VI, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 7 In unit-end test VII, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 8 In unit-end test VIII, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 9 In unit-end test IX, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 10 In unit-end test X, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 11 In unit-end test XI, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 12 In unit-end test XII, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 13 In unit-end test XIII, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 14 In unit-end test XIV, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 1 : 15 In unit-end test XV, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 2 : 16 In the comprehensive test I, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 2 : 17 In the Attitude test I, the results of the PSI group will be *better* than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Retention :

H — 3 : 18 In the comprehensive test II, the results of the PSI group will show *more* retentive capacity than that of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

H — 3 : 19 In the Attitude test II, the PSI group will show *more* retentive capacity than that of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

3.3 Null Hyupotheses :

Ho — 1 : 1 In the unit end test I, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 2 In the unit end test II, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 3 In the unit end test III, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 4 In the unit end test IV, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 5 In the unit end test V, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 6 In the unit end test VI, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 7 In the unit end test VII, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 8 In the unit end test VIII, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 9 In the unit end test IX, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 10 In the unit end test X, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 11 In the unit end test XI, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 12 In the unit end test XII, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 13 In the unit end test XIII, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 14 In the unit end test XIV, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 1 : 15 In the unit end test XV, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 2 : 16 In the comprehensive test I, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 2 : 17 In the Attitude test I, the results of the PSI group will *not* be better than those of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Retention :

Ho — 3 : 18 In the comprehensive test II, the PSI group will *not* show more retentive capacity than that of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

Ho — 3 : 19 In the Attitude test III, the PSI group will *not* show more retentive capacity than that of the Coventional Lesson Plan group, so far as the good, medium, poor and overall students are concerned.

3.4 Criterion and Experimental Variables :

There are statistical measures with which the two groups of students were compared. In this study the researche used 15 lesson unit-end (post) tests, 2 comprehensive tests, and 2 attitude tests as criterion variables.

The unit-end tests were used to test the achievement of the students over the particular unit. The comprehensive test was used to assess the achievement over all the 15 lessons immediately after the completion of teaching the 15 lessons. The Attitude test I was so used to test the attitude of the two groups (PSI and CLP) towards their teacher and their respective method of teaching. Comprehensive test II (Retention of Attitude test I) were used to test the retentive capacity of both the groups with respect to their attainment and attitude and to witness thedifference (if any) between the amount of decrease of attainment and attitude of the two groups.

3.5 Tools of Research :

In this piece of research work, the traditional Lesson plan method and the PSI method were used. The Lesson Plan method is the conventional method used in teaching any subject in a classroom of a secondary schol.

In this research work the researcher used the followings :—

I. Preparation of conventional Lesson plans (No. 15).

II. PSI Teaching Tools :
  (a) Preparation of study guide (No. 15)
  (b) Preparation of Mastery Gates (No. 15).
  (c) Preparation of parallel forms of mastery gates (No. 15).

III. Preparation of Achievement post-tests :
  (a) 15 unit-end Tests.
  (b) Comprehensive Test I No.

IV. Preparation of Attitude Post-test — I No.

I. Preparation of Coventional Lesson Plans :

A portion of the syllabus prescribed for the class IX was divided into 15 lesson units. On each lesson unit, one lesson plan was prepared following Herbartian steps. It stated objectives of the lesson at first after establishing rapport with the students. Then the teacher announced the day's lesson and subsequently presented the topic through question-answer technique. The teacher could take the help of different aids to concretise and simplify his/her lesson. Then he came to the application stage — where he assessed the newly acquired knowledge by asking questions of application level.

So the lesson planning is based on 5 steps —

(1) preparation,
(2) presentation,
(3) comparison and concretisation,
(4) simplification, and
(5) application.

II. PSI Teaching Tools Construction :

(a) Preparation of Study guide :

This should contain —

(1) introduction,
(2) objectives, and
(3) suggested procedure.

On each of the 15 units, one study guide would be prepared.

The introduction should state the utility of the particular unit (subject matter). It would state why the unit concerned was to be learned.

Objectives should state already what particular portions of the lesson (unit) were to be read. The rest of the lesson, being not so important from students' viewpoint, should be discarded.

Suggested procedure should help the students to go through the particular pages from particular books, mentioning both very clearly and carefully. It should also suggest avoidance of any detail.

Last but not the least, each study guide should suggest the students to try 'mastery gate' on the particular unit concerned, when they became thus ready to respond (being so by the study guide).

(b) Preparation of Mastery Gate :

Mastery gate on each unit would consist of 2 to 3 questions, covering the lesson (unit). The questions should neither be very short nor very long. They might be of short answer type, and objective type but should never be of essay type as the mastery gate allows only 10-12 minutes to answer.

(c) Preparation of Parallel forms of Mastery Gate :

A parallel form of each mastery gate on each unit should be prepared, because the students who would fail to answer form A would be offered again the equivalent or parallel form B so that they could master the particular unit concerned.

As the name suggests, each parallel form (B) would offer same type of questions. But the difference would lie in this that the languae of the questions or the art of questinong whatever one may call it, would be simple and straight than that of form A.

III. Preparation of Achievement (Post) Tests :

(1) Unit-end tests (15 in all) :

Each unit-end test will be of 5 marks. This 5 marks would be distributed among 5 questions. Naturally each question was to be answered within a minute. The questions should mostly be of objective type e.g. question to be answered in one word, or asking definition of something, question regarding true or false, matching type, recalls, yes or no, etc. etc. Time allotted for this unit-end test of 5 marks would be 5 minutes.

(2) Comprehensive Test (Post) :

This test was of 15 marks. This 15 marks had been distributed over 15 questions. The questions had been taken at random from all the 15 unit-end test questions; the procedure of selection was as follows :

Q.1 from unit-end test I;

Q.2 from unit-end test 2; etc.

Naturally there was no difference among the unit-end test questions and the comprehensive test questions. The difference would lie only in quantity not in quality. In fact, as the name would signify it would be comprehensive in nature.

IV. Preparation of Attitude (Post) Test :

The test would consist of 20 items. The first 13 items would testify and evaluate students' attitude towards personalized/conventional Lesson Plan Economics course (1981-82). The last 7 items would evaluate students attitude towards their teacher (teaching in PSI method/ Conventional lesson Plan Method). This attitude test had been constructed with the help of the questionnaires titled "Student Evaluation of 1970-71. Personalized General Psychology Course", "Student Evaluation of Teacher." (Sherman, J.G. 1974).

In this study, the researcher tried to study the superiority, if any, of the method of perosnalized system of Instruction over the Conventional Lesson Plan method, in teaching Economics at School level.

In the application of the PSI, with each unit plan, one study guide, one Mastery gate of form A and B (parallel in nature) were supplied to the students. The study guide on each unit would help the students to go through the unit concerned. The mastery gate would help them to achieve mastery over the unit. If a student could attain mastery over Form A, he should not go through Form B. After attaining mastery over one unit, the students would have to answer one Post Test (unit-end test) and score 80% (which was the criterion widely used in other PSI studies) so as to be declared fit to pass on to the next unit (lesson). The same Post-test had been applied to the lesson plan group (taught through the Conventional Lesson Plan Method) after they finished the same unit (lesson). In this way all the 15 units (lessons) had been completed both by the PSI Group as well as by the Lesson plan group. Immediately after the completion of the 15 units in this way, one comprehensive Test I and one Attitude Test I were applied to both the groups. The comprehensive Test was applied to evaluate the achievement of the two groups over the 15 units in all. The Attitude Test was applied to evaluate the students' attitude towards the course as well as towards their teacher and respective method of teaching. This helped to mark the distinction (if any) among the attitude of the two groups, the PSI group and the Conventional Lesson Plan (CLP) group.

After this an interval of 14 days was allowed. Then the same Comprehensive test and the Attitude Test, named comprehensive Test II, and Attitude Test II were again administered to testify the retentive capacity of both the groups (the PSI group and the CLP group) to prove the superiority of the method of PSI (if any) over the CLP method in teaching Economics at School level.

3.6 Statistical Method of comparison of Lesson Plan and PSI groups :

When inter group comparison was to be obtained between the conventional lesson plan method group and the personalized System of Instruction group, the researcher used ANOVA or analysis of varience. The F value was studied to notice any significant difference present between the application of the two methods, so far as the particular groups (good, medium, poor) or the total students of the two methods were concerned.

ANOVA, as test, possesses more sensitivity than the 't' test. As for example, so far as each unit achievemnt post test was concerned, when the PSI and the Conventional Lesson Plan teaching were compared, in each case the good, medium poor and all students of one method were compared with those of the other. Here Analysis of variance was used for inter group comparison, (good of PSI vs good of Lesson Plan method etc.) F value was found out to know the level of significance (at. 05 and .01 level).

When the initial Attitude Test scores of PSI and the ocnventional Lesson Plan teaching were compared group-wise, analysis of variance was used. F value was determined in each case and the level of significance at .05 and .01 was found out.

The same statistical method was used when the Attitude Test scores obtained after 2 weeks by each group of the PSI teaching method were compared with those of the Conventional Lesson Plan method.

3.7 Collection of Data :

The data for the study were collected between the period January, 1982 and February, 1982. the teacher (collaborator) was selected by the procedure discussed in 3.1(a). The teacher (collaborator) and the stand by teacher were trained in the two methods, the PSI and the CLP in the months of July and August in 1981 through demonstrations twice a week by the Researcher.

The teacher (collaborato) was then being supplied with the requisite syllabus to cover 15 lesson units, and the text book of the class concerned. She then was being taught to prepare 15 lesson plans following the Herbartian steps to deliver 15 lesson plans. Other tools of Research e.g. study guides, mastery gates, fifteen unit-end (post) tests, one comprehensive (post) test and one attitude (post) test were prepared in the manner as described in 3.5

The experiment started from the 2nd week of January, 1982 and continued till the first week of February, 1982. The 15 unit-end post-tests were applied in 15 days of actual teaching days; the comprehensive achievement test and attitude test were applied on the next teaching day. So in all sixteen days were required. Then a gap was allowed for 2 weeks in which no Economics was taught to any of the groups; after it, the comprehensive achievement test and the attitude test were repeated for another day over the same sample.

Before beginning the experiment proper, the teacher met the control group i.e. CLP group and explained to them, the procedure of teaching and demonstrated the same for 10 minutes on a topic "our School". On the same day she also met the experimental group separately and explained to them the procedure of PSI method of teaching and demonstrated the same for 10 minutes on the same topic. The researcher herself prepared the teacher before hand for the ground work of the instruction and demonstration.

In the conventional Lesson Plan class the teacher (collaborator) taught each lesson prescribed for the day following the Herbartian steps. After finishing the lesson within 40 minutes, unit-end post test on that day's lesson was applied. Each test sheet from each of the 25 students was then collected and the scores were given. Each test was set out of 5 marks. In this way for 15 lessons data were collected for 25 students taught through conventional Lesson Plan method. The comprehensive test was applied on the day immediately after the completion of the 15 unit-end tests. The comprehensive test was set out of 15 marks. 15 minutes were the time given. The 25 comprehensive test sheets were then collected from the 25 students and the sheets were then scored. All the data were then collected for the 25 students taught through the conventional lesson plan mehtod. On the same day, after the completion and the collection of the comprehensive achievement test sheets, the attitude test was applied to each of the 25 students. Each student was supplied with one attitude test paper. 15 minutes were allowed to answer the sheet. The attitude test was set out of 100 marks. This test comprised of 20 items, each item was divided on 5 point scale. Marks on each item ranged from 5 to 1. Each sheet was collected after being completed by each student, then the sheets were scored and data collected.

So these are all regarding the collection of the data on the 15 unit-end tests, one comprehensive test and one attitude test, the last two being applied on the same day. After a gap of 2 weeks, the same comprehensive test and the attitude test were repeated, data were collected in a similar manner. So nineteen set of scores, each set consisting the scores for 25 students were obtained.

Now, the collection of data regarding teaching the unit-end test, etc in case of those 25 students, who were being taught in the experimental method e.g. in the personalized system of instruction (PSI) should be stated.

Each day, the collaborator (teacher) started the class with the study guide on each unit lesson, and mastery gate having two parallel forms (A & B) on each unit lesson. Before the beginning of the experiment actually, the teacher (Collaborator) described the procedure in details, stating the role of the study guide and the mastery gate. Then on each day, the teacher first of all used to give the gist of the day's lesson unit within 10 minutes. Then the students were being supplied with the study guides and the mastery gates. Each student was allowed to consult the study for 15 minutes; 5 minutes were allowed to go through the mastery gate and giving the answer. Here the teacher (collaborator) had to check the performance. If the student could attain 80% mastery,she would be allowed to answer the unit-end test. If the student failed to attain 80% mastery over the form A, she would be supplied with the parallel form B. After attaining 80% mastery (which is being expected this time), She would be allowed to go through the unit-end test, which is the same as that given to the students taught through the conventional lesson plan method. In the personalized system of instruction (PSI) method, time is not the factor, but it is the mastery of the lesson taught which matters. But as the situation compels, the whole thing is to be managed within 40 munutes which is the scheduled time for one period for teaching economics. In this way all the 15 lesson units were being finished; the unit-end test for each day was scored and the data collected. the comprehensive test and the attitude test were all given in another period on another day. The data were collected in a similar way. These last two tests (comprehensive achievement and attitude) were repeated after a gap of 2 weeks, and data collected. Here also, i.e. in the case of experimental method (PSI) also the researcher got 19 sets of scores each set consisting scores of 25 students.

So in all the researcher got data consisting 19 pair of sets, each set constaining scores of 25 students.

The raw score data of —

(a) Annual Examination Marks of two groups of students, each containing 25 students;

(b) Scores fo 15 pairs of unit-end tests;

(c) Scores of two comprehensive Achievement Tests; and

(d) Scores of two attitude Tests.

(All given in Appendix III).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Discussion of Results of 15 unit-end Achievement Tests.

The result and discussion was based on the analysis of the data. It was undertaken to draw logical inference concerning the tenability of the given hypotheses with a view to ascertaining what contribution the study would make in the feasibility study of introduction of personalized system of Instruction (PSI) method for teaching economics at Secondary level. The rejection or acceptance of the Null hypotheses would determine the nature and extent of the feasibility.

The analysis of the data in the present study would include a comparison of outcomes in nineteen measures of two treatments on the basis of t-value, at one-tail test at .05 and .01 level of significance. The data relevant to each hypothesis would be assembled and tested to determine whether or not there is significant difference in the results obtained from the two treatment groups so far as the good (G), medium (M), poor (P) and overall or total (T) students are concerned.

The analysis of the data is given in Table.

Table 4.0 : PSI and the Conventional Lesson Plan Teaching Compared

Achievement Test	Group	Df.	F-Value	t (= √F)
1	G (=9)	8	1.90	1.3784
M	M (10)	9	0.30	0.6164
	P (6)	5	0.26	0.5099
	T (25)	24	0.98	0.9899
2	G (=9)	8	0.51	0.7141
	M (10)	9	0.14	0.3741
	P (6)	5	0.20	.4472
	T (25)	24	0.10	.3262
3	G (=9)	8	1.38	1.1747
	M (10)	9	0.89	.9434
	P (6)	5	0.38	.6164
	T (25)	24	0.06	.2449
4	G (=9)	8	1.66	1.2884
	M (10)	9	0.83	.9110
	P (6)	5	1.75	1.3229
	T (25)	24	4.23	2.0566
5	G (=9)	8	0.03	.1732
	M (10)	9	5.59	2.3643
	P (6)	5	2.91	1.7058
	T (25)	24	6.48	2.5455
6	G (=9)	8	0.13	.3605
	M (10)	9	0.49	.7
	P (6)	5	1.06	1.0295
	T (25)	24	1.04	0.2
7	G (=9)	8	0.43	.6557
	M (10)	9	3.85	1.9621
	P (6)	5	8.36	2.8913
	T (25)	24	9.91	3.1480
8	G (=9)	8	0.05	.2236
	M (10)	9	0.85	.9219
	P (6)	5	0.57	.7549
	T (25)	24	0.02	.1414
9	G (=9)	8	9.11	3.0182
	M (10)	9	6.21	2.4919
	P (6)	5	0.74	.8602
	T (25)	24	13.82	3.7175

Table 4.0 : PSI and the Conventional Lesson Plan Teaching Compared — Contd.

Achievement Test	Group	Df.	F-Value	t (= √F)
10	G (=9)	8	13.24	3.6386
	M (10)	9	0.00	0.0
	P (6)	5	0.76	.8717
	T (25)	24	0.65	.8062
11	G (=9)	8	1.38	1.1747
	M (10)	9	2.99	1.7291
	P (6)	5	4.09	2.0223
	T (25)	24	1.82	1.3490
12	G (=9)	8	2.65	1.6278
	M (10)	9	0.00	0.0
	P (6)	5	0.51	.7141
	T (25)	24	0.11	.3316
13	G (=9)	8	4.22	2.0542
	M (10)	9	3.03	1.7406
	P (6)	5	0.55	.7416
	T (25)	24	2.92	1.7088
14	G (=9)	8	3.97	1.9924
	M (10)	9	4.55	2.1330
	P (6)	5	0.66	.8124
	T (25)	24	9.68	2.9461
15	G (=9)	8	0.28	.5291
	M (10)	9	8.65	2.9410
	P (6)	5	0.33	.5744
	T (25)	24	2.11	1.4525

Table 4.1 : PSI and the CLP Teaching Compared :

Treatment	Group	df	F-Value	t-Value
Comprehensive Achievement Test (Initial)	G (=9)	8	1.85	1.36
	M (10)	9	.068	0.26
	P (6)	5	3.841	1.96
	T (25)	24	0.005	0.07

Table 4.2 : PSI and the CLP Teaching Compared :

Treatment	Group	df	F-Value	t-Value
Attitude Test (Initial)	G (=9)	8	1.78	1.334
	M (10)	9	2.55	1.597
	P (6)	5	2.38	1.543
	T (25)	24	0.77	0.877

Table 4.3 : PSI and the CLP Teaching Compared.

Treatment	Group	df	F-Value	t-Value
Comprehensive Achievement Test (Retention)	G (=9)	8	.372	0.61
	M (10)	9	.865	0.93
	P (6)	5	3.158	1.68
	T (25)	24	5.244	2.29

Table 4.4 :; PSI and the CLP Teaching Compared.

Treatment	Group	df	F-Value	t-Value
Attitude Test (Retention)	G (9)	6	0.03	0.173
	M (10)	9	0.20	0.447
	P (6)	5	0.00	0.000
	T (25)	24	0.19	0.436

The computerized data is used to find the t-Values. The level of significance of t-Values at one-tail test is obtained with the help of the master key table prepared from Garrett (1981).

Table 4.5 : Master Key Table to check level of significance.

df	Level of Significance (one-tail test).	
	.05	.01
5	2.02	3.36
8	1.86	2.90
9	1.83	2.82
24	1.71	2.49

(Source : Garrett, H.E., Statistics in Psychology and Education, Bombay : Vakils, Feffer & Simons, 1969, Table D,p. 461).

In Achievement Test I, there is no significant difference in the outcome between the groups taught by the PSI method and the CLP method at .05 level so far as the Good (G), medium (M), poor (P) groups are concerned. The same result was obtained when the total (T) students of the two groups were compared.

In Achievement Test 2, there is no significant difference in the outcome between the PSI method and the CLP method at .05 level so far as the good, medium and poor groups are conemed. The same result was obtained when the total students taught under the PSI method were compared with the total students taught under the CLP method.

In Achievement Test 3, there is no significant difference in the outcome between the PSI method and the CLP method at .05 level so far as the good, medium and poor groups are concerned. The same result was obtained when the total students taught by the PSI method were compared with the total students taught under the CLP method.

In Achievement Test 4, there is no significant difference in the outcome of the groups taught by the PSI method and the CLP method at .05 level so far as the G,M,P groups are concerned. But the difference in the outcome of the two methods is significant at .05 level, when total group taught under the PSI was compared with the total group taught under the CLP method. The former group was found scoring higher than the latter group.

In Achievement Test 5, there is no significant difference in the outcome between the PSI method and the CLP method at .05 level so far as the G and P students are conemed. But so far as the M students are concerned the difference is significant at .05 level.

It is to be noted that the difference in th eoutcome is significant at .01 level when the total group of PSI method was compared with that of the CLP method.

In Achievement Test 6, the difference in the outcome of the two methods is not at all significant at .05 level when the good, medium, poor and total students of one method are compared with the corresponding groups of the other method.

In Achievement Test 7, the difference in the outcome between the groups taught by the PSI method and the CLP method is significant at .05 level when the M and P students are compared. But the difference is not at all significant when the G students taught by the PSI method are compared with the corresponding group taught by the CLP method.

It is to be noted however, that the difference in the outcome is significant at .01 level when the total (T) students taught by the PSI method are compared with the total (T) students taught by the CLP method.

In Achievement Test 8, the difference in the outcome between the two methods is not at all significant at .05 level when the G, M, P as well as the T students of the PSI method are being compared with the corresponding groups taught by the CLP method.

In Achievement Test 9, there is no significant difference in the outcome between the groups taught by the PSI method and the CLP method at .05 level so far as the poor (P) students are concerned. The difference in the outcome between the two methods is, however, significant at .05 level so far as the medium (M) students are concerned. However, the differene in the outcome between the two groups is significant at .01 level when the good (G) students as well as the total (T) students taught by the PSI method are being compared with the corresponding students taught by the CLP method.

In Achievement Test 10, there is no significant difference in the outcome of the two methods at .05 level when the poor (P) and medium (M) students taught by the PSI method are being compared with the corresponding groups taught by the CLP method.

But the difference in the outcome of the two methods is, however, significant at .01 level when the good (G) students taught by the PSI method are being compared with the corresponding group taught by the CLP method.

It should however be noted that there is no significant difference at .05 level in the outcome between the two methods when the total (T) students taught by the PSI method are compared with the T students taught by the CLP method.

In the Achievement Test 11, there is no significant difference in the outcome at .05 level between the groups taught by the PSI method and the CLP method when the good (G) students, medium (M) and total (T) students are considered.

However, the difference is significant in the outcome at .05 level between the two methods when the poor (P) students taught by the PSI are being compared with the corresponding group taught by the CLP method.

In the Achievement Test 12, there is no significant difference in the outcome between the groups taught by the PSI method and the CLP method at .05 level so far as the good (G), medium (M), poor (P) and total (T) groups are concerned.

In the Achievement Test 13, there is no significant difference in the outcome between the groups taught by the PSI method and the CLP method at .05 levelso far as the medium (M) and the poor (P) students are concerned.

The difference in the outcome between the groups taught by the two methods is however significant at .05 level when the good students of the PSI method are compared with the corresponding group of the CLP method. The same result is obtained when the total (T) students taught by the PSI method are being compared with the total (T) students taught by the CLP method.

In Achievement Test 14, the difference in the outcome between the groups taught by the PSI method and by the CLP method is significant at .05 level so far as the good (G) and medium

(M) students are concerned. But there is no significant difference in the outcome between the groups taught by the aforesaid methods at .05 level so far as the poor (P) students are concerned.

It is to be noted however that the difference in the outcome between the groups taught by the PSI method and the CLP method is significant at .01 level when the total (T) students of the one method are being compared with the corresponding students of the other method.

In the Achievement Test 15, there is no significant difference in the outcome of the groups taught by the PSI method and the CLP method at .05 level so far as the good (G) and the poor (P) students are concerned. It is to be noted however, that the difference in the outcome is significant at .01 level when the medium (M) students taught by the PSI method are compared with the corresponding group taught by the CLP method.

However, when th etotal (T) students of both the methods, the PSI and the CLP are being compared, the difference in the outcome is not at all significant at .05 level.

The above findings are expressed in the following figure.

Figure 4 :1 Significance of G, M, P and T in 15 unit-end Tests.

	G	M	P	T
Significant at .01 level	10 9	15 9		14 9 7 5
Significant at .05 level	14 13	14 7 5	11 7	13 4
Threshold of Significance	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 X
Not Significant	5 6 7 8 X X 11 12 X X 15	X 6 X 8 9 10 11 12 13 X X	5 6 X 8 9 10 X 12 13 14 15	X 6 X 8 X 10 11 12 X X 15

From Figure 4.1 (obtained as a result of our experiment), we had 17 elements out of 60 having significance at a level of .05 and above. In all we had 60 (= 15 x 4) such unit-end elements, tested statistically. So, we had 28.3% elements having significance at a level of .05 and above. The above finding revealed that PSI is not better than the CLP method as a technique of classroom teaching, inspite of certain progressive features of pedagogy.

In case of the good students, however, we had 4 elements out of 15 having a level of significance .05 and above. We can express this in terms of percentage as 26.6%.

In case of medium students we had 5 elements out of 15 having a level of significance .05 and above. In terms of percentage this is 33.3%.

In case of poor students only 2 out of 15 had a level of significance at .05 and above. It can be expressed in terms of percentage as 13.3%.

So, it is revealed from the above analysis that PSI is not at all suitable for the poor students. [PSI can not be preferred to the traditional CLP method of teaching in the case of poor students. However, PSI can be applied in the case of medium students and also in the case of good students to some extent, (the case being 33.3% & 26.6% respectively].

If we scan the cases at a level of significance .05 and .01 we will have the following picture

For the whole 60 elements we had 9 only at a level of .05 significance; expressed in terms of percentage it is 15.0%.

For the good group only two out of 15 had a level of significance of .05; expressed in terms of percentage, it is 13.3%.

For the medium group only 3 out of 15 achieved a level of significance of .05; expressed in terms of percentage it is 20%.

For th epoor only 2 out of 15 had a level of significance of .05; expressed in terms of percentage; it is 13.3% (same as the good group).

Now, if we consider the cases at a level of significance of .01 we had 8 out of 60 for th etotal expressed in terms of percentage it is 13.3%.

For the good group we had only 2 elements out of 15 having achieved a level of significance of .01. If we express this in terms of percentage we get 13.3%.

When we consider the medium group's achievement at a level of significance of .01 we had a percentage of 13.3%.

For the poor group no cases were found achieving a level of significance of .01

So, PSI came out as a technique of classroom teaching not suitable for the poor group for achievement as a criterion. And for the good and medium students also the picture is not very bright in comparison with the traditional CLP method of teaching.

4.2 : *Discussion of Results Comprehensive Achievement and Attitude Tests.*

Table 4.1 : PSI and CLP methods compared for Comprehensive Test (Initial).

Treatment	Group	df	F-Value	t-Value	Level of Significance	
					.05	.01
Initial comprehensive Achievement Test	G (9)	8	1.85	1.36	Not	
	M (10)	9	0.068	0.26	"	
	P(6)	5	3.841	1.96	"	
	T (25)	24	0.005	0.07	"	

Since the obtained t-values for G, M, P and T are not significant at .05 level, the null hypothesis is accepted.

From the results of the experiment i.e. after teaching two equivalent groups by the PSI and the CLP methods over 15 units in Economics, we obtained the end achievement of the PSI group not better than the CLP group.

So the result showed that PSI is not a better method by this criterion variable.

Ho 2 : 16 discussed.

From the Figure which plots the significance of 15 unit-end tests, we find —

(i) for the G Group, only 4 tests (13.14) and (9.10) are significant. For the M group only 5 tests (5.7.14) and (9.15) are significant. For the P group only two tests (7.11) are significant at .05 level. So it seems that the method did not find favour with the poor group. Whereas for G and M groups PSI is found to be better in 4-5 cases out of 15 i.e. about 30% times.

(ii) comparing the two groups in totality it was found that PSI is significantly better for tests (4.13) and (5, 7, 9, 14). So in 6 units out of 15 units, PSI is better. Out of these 6 units, for 4 units the significance is at .01 level. It seems, therefore, that although PSI method is not clearly found better than CLP method but it can not also be concluded that PSI is not significantly better. Taking everything in consideration, it may be concluded that the experiment partially supports the experimental hypothesis that PSI seems to be a better method.

H—1 : 1 — 15 are discussed.

Table 4.2 : PSI and CLP methods compared for Attitude Test (Initial).

Treatment	Group	df	F-value	t-value	Level of significance.	
					.05	.01
Attitude (Initial)	G (9)	8	1.78	1.334	Not	
	M (10)	9	2.55	1.597	"	
	P (6)	5	2.38	1.543	"	
	T (25)	24	0.77	0.877	"	

Since the obtained t-values for G, M, P and T are not significnat at .05 level, the null hypothesis is accepted.

From the results of the experiment the end attitude of the PSI group is not better than that of the CLP group. So the result showed that the PSI is not a better method by this criterion variable.

Ho-2 : 17 discussed

The result would now be discussed for retention after 2 weeks for Comprehensive Achievement Test Scores and Comprehensive Attitude Test Scores.

4.3 Discussion of Results of Retention.

Table 4.3 : PSI and CLP Methods compared for Retention of Comprehensive Achievement.

Treatment	Group	df	F-value	t-value	Level of significance.	
					.05	.01
Comprehensive Achievement Test after 2 weeks (Retention)	G (9)	8	.372	0.61	Not	
	M (10)	9	.865	0.93	"	
	P (6)	5	3.158	1.68	"	
	T (25)	24	5.244	2.29	Yes	

Since the obtained t-values of G, M, and P are not significant at .05 level, the null-hypothesis is accepted for the three sub-groups. But for the whole group (T), the t-value is significant at .05 level. So the null-hypothesis is rejected for the whole group.

From the experiment the result shows that although the achievement of the three sub-groups experienceing PSI method were not retained more in comparison to the sub-groups of the CLP method, the whole PSI group showed better retention of the total lessons learnt in comparison to the whole CLP group. This finding is significant. Although at immediate comprehensive achievement, PSI did not come out as a better method, by the criterion of retention of it PSI is significantly better when both the groups are compared entirely.

It may therefore be concluded that for the criterion of retention of achievement PSI is a better method of teaching.

Ho - 3 : 18 discussed.

Table 4.4 : PSI and CLP methods compared for Retention of Attitudes.

Treatment	Group	df	F-value	t-value	Level of significance.	
					.05	.01
Attitude	G (9)	8	0.03	0.173	Not	
(after 2 weeks)	M (10)	9	0.20	0.447	"	
(Retention)	P (6)	5	0.00	0.000	"	
	T (25)	24	0.19	0.436	"	

Since the obtained t-values of G, M, P and T are not significant at .05 level, the null-hypothesis is accepted.

From the experiment, the result showed that the PSI group is better than the CLP group in the criterion of retention of attitude.

Ho-3 : 19 discussed

4.4 : *Critical Evaluation of the Advantages of PSI method over CLP method in the light of the present study vis-a-vis previous research.*

A great many studies have attempted to compare PSI with another more traditional educational technique, with the second technique serving as a control condition. This control condition is oftern a post-hoc selection of a new PSI user's lecture course from the previous semester.

We shall discuss the general question of whether PSI produces substantially different outcomes in student performance as compared to traditional educational approaches. Within this general framework the following questions arise :—

(1) Does PSI increase test performance ?

(2) Do student withdrawal rates affect performance in a PSI course format ?

(3) How do students evaluate the PSI course ?

(4) Does PSI affect student retention rates ?

Outcome Studies :

Many descriptive reports have pointed to the large number of high grades (A's and B's) in a PSI course as evidence that the PSI method is more effective than a more traditional lecture format. Many report that the same instructor will assign more A or B grades when he teaches a course using PSI than he did in an earlier semester when teaching in a more conventional manner. (Keller 1967, 1968, 1970; Moore, Mahan and Ritts 1969; Hoberock 1972). While the grade distribution does radically change in most PSI courses, the simple presentation of grade distributions or of verbal reports by the students earning, the higher grades is no substitute for observing what the subject does with the material.

Several experiments have compared students in traditional lecture and in PSI courses based on examination performance (McMichael and Corey 1969; Corey and McMichael 1970; Moore, Mahan and Ritts 1969; Gallup 1974; Sheppard and MacDermot 1970; Morris and Kimbrell 1972; Witters and Kent 1972; Alba and Penny Packer 1972; and Born, Gledhill and Davis 1972). There are similarities in the results to be found in the research literature. The first and the most important is that all studies report that PSI is at least as good as, if not better than, more conventional techniques.

In a representative study, McMichael and Corey (1969) found that PSI psychology students performed significantly better on multiple choice examinations than did three control sections using the same text and covering the same material (P .0001). In a replication of this study, Corey and McMichael (1970) found even greater difference in final examination performance, with the PSI students again performing significantly higher.

When the PSI was first utilized, there was much speculation that PSI was probably useful in teaching simple academic skills that were bound by strictly defined and limited subject areas. Many felt that PSI could not be utilized in conceptual or creative learning. Now there are experiments that demonstrate increased student performance on tests requiring both recall and application when a personalized format is used rather than a more conventional presentation of content material (Morris and Kimbrell 1972). Sheppard and MacDermot (1970) also found superior results in the PSI group when essay answers were required as performance measures. However, in their study the unit quizzes were in the form of oral interviews (Ferster 1968) requiring some practice of verbal fluency which may influence essay answering behaviors.

Born, Gledhill and Davis (1972) found that students were not handicapped in performance on a complex final examination by prior exposure to the shorter questions and answers required for unit quizzes. Other experimental data confirm these general findings (Hursh et al, 1973). Thus, a considerable amount of research seems to verify that PSI is effective in courses streesing the acquisition of complex academic repertories. It is clear, however, that numerous and more controlled experiments need to be conducted in areas other than basic Psychology before this controversy can be conclusively settled.

Another basic criticism is that within a Personalized instructional format, students have more exposure to test questions than do control groups. Many feel that this "practice effect" could be the significant contributor to better performance acores. However, in a well designed experiment the final examination should not contain items which the PSI students alone have seen. Although many studies are unclear shout prior exposure to test items, the McMichael and Corey (1969) and Corey and McMichael (1970) studies do not contain such a bias.

Another study by Alba and Pennypacker (1972) managed to control for this particular bias by administering fill-in-items to the experimental group and multiple-choice items to the control group. Since the final examination for both groups consisted of both types of questions, students in both groups had been expressed to final examination test items on a random basis. This procedure seems justified, in that test validity may be different for the two groups if an "independent final evaluation" is administered. Pretest to post-test change scores also were computed as an evaluation procedure necessitating the use of identical items. It is interesting to note that the experimental group performed significantly better on both types of questions. However, if memory processes inolved in recall are considered to be of a higher order nature than these involved in recognition, then the control group would seem to have an advantage in pre-final testing. On the other hand, the control group would be at a disadvantage on the final in that they had no prior exposure to the more difficult fill-in-item construction.

There is a concern that greater exposure to test items of some form (fill-in, multiple-choice, etc.) might be the crucial variable in superior final examination performance by Personalized Instruction groups. Born Gledhill and Davis (1972) report that students in the PSI group had received both essay tests and fill-in quizzses throughout the semester in addition to the same mid-term and final taken by the lecture group. Thus there were "many opportunities for proctors to 'shape' examination writing skills" (p. 42). Although the proctors had no opportunities to affect appropriate answering of multiple-choice items, the PSI group performed somewhat (but not significantly) better.

Moore, Mahan and Ritts (1969) tried to control for this in their biology and psychology courses by giving the unit quizzes to all experimental and control groups. They found superior final examination performance for both PSI groups. Unfortunately, the weight of the final examination in determining the course grade was unclear. If one assumes that grades are a motivating factor, differential examination performance may be due to the value a final examination has for a given course. This criticism may also apply to the Clerk (1973) Introductory Sociology Comparison Study. A controlled experiment must indeed hold this factor constant.

It is interesting to note that several studies have introduced biases favoring the control group. For example, the final examination on Sheppard and Mac Dermot's (1972) programmed course did not affect the final grade while the examination accounted for 50 percent of the control group's final grade. They still found that final examination performance was significantly better for the programmed group. In the McMichael and Corey Study (1969), only the control group had been previously exposed to some of the items on the final examination; however, the personalized Instruction group still performed significantly better.

Retention : *Three studies have attempted to measure long term retention differences between PSI and control Groups.*

Corey and McMichael (1970) report that after a lapse of one semester (19 weeks), the same final examination administered in the first half of two semester course was given without notice to students in the second half of the introductory psychology course (lecture method). Of the students who were included in the original experiment (30 percent of the PSI group and 24 percent of the three control groups), it was found that the PSI students scored 9.7 percent higher than the control group. The authors concluded that the effects of the method are quite durable.

Austin and Gilbert (1973) found similar results in a test for retention after a lapse of 2 months, finding that the PSI students scored 15 to 20 percent higher than the lecture recitation students. This differential retention rate was greater than the 10 to 15 percent difference found in the original final examination.

Cooper and Greiner (1971) found that when 60 percent of both the PSI and control students were given an unexpected long-term retention test (not a retest) on the material covered 5 months earlier, the PSI group performed significantly better (P .01).

It is interesting to note the differential amounts of "forgetting" that occurred in the above three studies. Although there was a linear relationship between amount forgotten in the experimental as compared to control group in a given study, the decreases in performance found in the three studies vary widely. On identical retests, Corey and McMichael (1970) report an approximately 6 percent decrease in scores for both groups. Austin and Gilbert (1973) report an approximate 20 percent decrease in both experimental and control groups. Cooper and Greiner (1971) randomly selected questions from a test item fill (students from both groups therefore may have been some of the questions previously) and found a decrease of 65 percent in performance when compared to the original scores for both groups.

Controlled studies comparing PSI with conventional lecture sections have been reported in a number of disciplines other than psychology. Areas of such comparison include Physics (Austin and Gilbert 1973); Phillipas and Somerfeldt 1972:) biology (Moore, Mahan and Ritts 1969); economics (Tietenberg 1973); and anthropology (Witters and Kent 1972);

Unfortunately, many comparison reports have unavoidably utilized different materials for experimental and control groups (Clark 1973) on materials differing from previous semesters (Hoberock et al, 1972), leaving their results open to question. However, all reports have shown significantly superior performance by the PSI students.

It is interesting that most reports show that (in comparison to psychology) in other disciplines procedures are implemented that more closely follow the original outlines of the method (Keller 1966, 1968). This is to be expected, especially when one considers that many of the psychology studies have been undertaken by professionals in reinforcement theory and contingency management techniques, and the researches would thus be more likely to feel confident in experimenting with variations in procedures. The reported sucess in other areas suggests that the method has wide applicability to other content and can be undertaken by professionals in disciplines other than psychology. These findings contribute to the confirmation of the wide application and generalizability of the method as originally indicated in McMichael and Corey (1969).

One final point must be made in evaluating the results reported here. There is a tendency among researchers (especially behavioral psychologists) to develop their own version of the basic Keller/Sherman plan. Many of these versions are quite complex; therefore, the superior results reported for their "personalized instruction" course are difficult to apply in the general classroom setting. More importantly, if we consider present comparisons of conventional and personalized instruction procedures to be at a gross evaluative level, and if we begin to ask questions concerning the effects of various components in the system, then further research must utilize procedures that are clearly reported and of Genrral Significance to the user of personalized instruction. We must treat each component or aspect of the system as a variable and manipulate it in a systematic fashion, implementing a procedure system that generates generalizable data of significance to the majority of educational programmes.

The great majority of the studies summarized above conclude significantly that personalized instruction is more effective in a wide variety of disciplines than more conventional approaches. However, the need exists for additional methodologically and procedurally sound studies both within and outside psychology.

Miller (1973), in the reviewer's comments, points out that virtually all past research has relied on between-group designs and expresses consternation over the fact that "our knowledge of the effects of such procedures is based on such weak design" (Semb 1973 b; Miller and Weaver 1972; and Born, Gledhill and Davis 1972). With respect to this last comment, as well as to the need for more and better comparison studies Miller and Weaver (1972) perhaps summed it up best : "Let us remember what happened to the programmed instruction movement as it floundered on the shoals of faith unaccompanied by hard-nosed experimental evluation" (p. 398).

4.5 : Limitations of the Study :

The study concerned round two equivalent groups of 25 each, of the same school of the district of Hooghly. This naturally led to several limitations;

(1) if the research could be made on larger sample and in reasonably variety of schools, the findings could be more reliable and valid. But in support of our case, it might be cited that the two groups are of equivalent nature, and they represent a standard secondary schools of the Board of Secondary Education, West Bengal.

(2) Secondly, the 50 students (in our case) have been divided into two groups. One group of 25 students was taught economics by the conventional lesson plan method and the other group was taught by the experimental method. (by the personalized System of Instruction in our case). If the same group could be taught by the two methods, and results obtained, findings could become more reliable and valid.

(3) Thirdly, it may again be noted that the students were given only 15 unit-end tests, one comprehensive-test, one attitude post-test and the last two tests were repeated after 2 weeks to test their retention. Results and findings might have been otherwise, if more units and post-tests were tried and retention could have been more justifiably testified, if time gap could be allowed for more than 2 weeks.

(4) Fourthly, so far as the unit-end post-tests (e.g. 15 unit-end post-tests) are concerned something must be noted regarding the time and the volume of questions, asked in each unit-end test. only 5 minutes were allowed to the students to answer a question paper consisting of 5 questions, that too mainly of objective nature. Research findings might have been otherwise, if more questions were asked, of course more time should be allowed for this.

(5) the questions in each test were mainly on knowledge, which definitely allows some space for memorization. Some scope should have been given for application as well.

(6) Some limitations could have been cited for the comprehensive achievement test. The questions in the comprehensive test I, (No. 16) were selected as per random sampling from the previous 15 unit-end tests. Time allowed was 15 minutes and questions to be asked were 15 in number. Findings could have been otherwise, if more questions were being asked of course in a greater time.

(7) It may again be noted that things could have been otherwise if the two groups, (the conventional lesson plan group and the experimental group taught by the personalized system of instruction method) could be taught in opposite methods. Our present conventional group could be taught by the experimental method i.e. by the personalized system of instruction method (PSI) and the experimental group could be taught by the conventional lesson plan method.

However, in support of our findings it may be said that the two groups are equivalent in nature. So we should not expect results otherwise if the groups were selected for opposite methods.

(8) Findings could be more reliable and valid, if more students could be taken as sample, from more schools and from more districts. But we may state in support of our work that the school selected in our case is a standard secondary school under the Board of Secondary Education, West Bengal.

(9) Regarding the students comprising the two groups, it can be said that they represent the lower middle class of the society. Research findings could have been othrwise, if sample taken represented the upper middle class or the poor class.

(10) Our work was based on a standard secondary school, situated in the district of Hooghly.

The students represented the middle class of the muffussil area. Findings might have been otherwise, if the sample could be taken from a city school on the one extreme or from a backward area on the other.

So, findings are the resultants of so many factors — e.g.. construction of the tests, time allowed, nature of the sample, (whether it represents the upper class, middle class or poor class) the nature of the school (whether it represents the backward area of a village or the advantageous area of a city). The intensity of limitations is directly related with these factors. The limitations are removed to the extent to which these factors can be made reliable.

However, no study however carefully designed and executed can be perfect. The present study was also no exception. It had rather several limitations.

First, it was a comparative study in disign and criticism of comparative studies are of two main types — those which criticize them on methodological grounds and those which criticize them on utilitarian grounds for trying to answer the wrong questions.

The first and the most frequently invoked methodological criticism relates to "Howthorne effect" (Neidt & Sjogren, 1968). About Howthorne effect, Mackenzie (1963) commented : "Sometimes students react to a new method with enthusism, at other times, with outraged hostility. A hostile reaction seems particularly likely when students taught by a new method know that they are competing on examinations with students taught by traditional method". This "Howthorne effect" partly influenced the samples of the study. The students in PSI group had initially a sceptic notion about the variation of their conventional lesson plan method but after some exercises in personalized system of instruction (PSI) method they became too enthusiastic about PSI which the conventional lesson plan group observed, and as a result, they started feeling deprived. It was difficult to maintain an equal level of motivation for both the groups.

The second line of criticism, a comparative effectiveness study is based on utilitarian grounds. It attacks them for claiming a false degree of generalizability and for trying to answer questions of no practical use. As Lumadaine (1963) pointed out that conclusions from an evaluative study of a single set of lectures, films on programmes can only be applied to those particular lectures, films on programmes and the genralizations of the results to other lectures, films or programmes has, at most the status of an untested hypothesis. In the present study no attempt was, therefore, made to generalize the utility of PSI.

The other limitations of the study were —

a) The sample was pre-determined, that is, it consisted of the students of class IX of a particular school having economics as the additional subject. It was not tested whether it stood for an adequate sample of the population, that is th etotal students of West Bengal having economics as the additional subject at secondary stage.

b) It was the concensus of the conventional lesson plan group that students, who were accustomed to direct teaching, when taught indirectly, became confused and surprised, at least at the initial stages of personalized system of instrucion method.

4.6 : Needed Research :

The problem we have been discussing in this dissertation have highlighted the limited nature of our present knowledge of the role of personalized system of instruction (PSI) vis-a-vis conventional lesson plan method in the teaching of students of economics at the secondary level.

It seemed useful to conclude the piece of research with the following suggestions for further experiment and enquiry which had arisen from a consideration of all elements in the study :—

i) The study should be replicated in the other secondary students having economics as the additional subject in other schools as much as possible.

ii) Attitude of students in the PSI group as well as of the conventional lesson plan group towards the mode of teaching should additionally be studied step-wise throughout the experimentation and compared.

iii) A follow-up study should be made after 3 months, 6 months and 1 year to see whether the better results exhibited by the PSI group over the conventional lesson plan group persists in real classroom situation.

iv) The effectiveness of self feedback should be studied.

v) A refinement of the present study could be achieved, if each period (class) could be offered for sixty minutes fo r one unit lesson instead of 40 minutes. In our study 5 minutes were offered out of 40 minutes for each unit-end test. But our research could be made more refined, if 15 minutes could be offered for each unit-end test, and 45 minutes fully devoted for teaching.

Moreover, our unit-end tests could be made more refined, if each test could be divided into memory, understanding, and application level separately and number of questions could be increased reasonably to testify the above three qualities separately.

vi) The organisational and economic feasibility of including personalized system of instruction (PSI) as a teaching method for large number of students should also be studied.

vii) Whether the conventional lesson plan method of teaching with required improvement both on the part of the students and teachers, and the method itself has advantages over PSI teahing method in experimental situation should be explored. Experiment and studies of the type suggested might lead to a more accurate assessment of personalized system of instruction (PSI) and more effective provision for it in the secondary school. To any one who regards students' achievement of knowledge as one of the main aims of teaching, such studies must surely be given priority.

4.7 : Conclusion :

If one is to assess the superiority of PSI as an innovative classroom teaching technique over the CLP method of teaching, one should have to consider the matter from several angles, e.g.

- its effectiveness as a technique of improvement of attitude (positive).
- its effectiveness in terms of retention.
- and above all cost-benefit side.

At the end of the piece of this study, the researcher had to come to the conclusion that as a technique of achievement PSI is not superior to the CLP method of teaching, and specially in the case of the students of poor quality. So the question of retention does not come at all in the picture.

But regarding the attitude of the students towards the technique as well as towards the teacher, the researcher found a positive response. This is a good sign no doubt.

Regarding cost-benefit side, when considered in money terms, PSI does not cost any extra because it can be fitted within the usual classroom setting of course with a little bit of change of order; but when considered in terms of manhour, it costs definitely; because there are many steps before and after the application of the format, which the teacher ought to resort to.

So the researcher is of the opinion that if the good features of PSI are to be taken advantage of , the teachers should be given enough of time, freedom of variability in teaching technique and enough scope of preparation of teaching materials for implementing such innovative techniques at school level. The school authority, the students and the guardians should also be mentally prepared first to accept the challenge before the actual implementation of the teaching method in place of the traditional method. Innovative methods like PSI activates students' mind, whereas traditional method of class lecture ossifies it — what Education is to enliven.

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